

CHEMICAL & METALLURGICAL ENGINEERING

DECEMBER, 1942

CAN THESE LADIES HELP TO "MAN" PRODUCTION?

If these girls pass Prof. "Jim" Coull's 4-month course in chemical plant operation, they'll find jobs in Koppers' new synthetic rubber plant. Thus will come some relief for the pressing problems of technical manpower that receive our attention on pp. 77 and 91-2.

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To provide the additional chlorine needed for our greatly expanded production of magnesium, polyvinyl chloride and neoprene has called for the construction of modern electrolytic plants utilizing most recent developments in processes and equipment. One of the most popular designs is shown in this month's pictured flowsheet on pp. 114-117.

BUTADIENE FROM ALCOHOL IS OUR NO. 1 PROBLEM

As the new co-polymer plants get into production it becomes more evident that the synthetic rubber program depends primarily on the butadiene output. Most progress is being made in the alcohol plants. Various alcohol-butadiene conversion processes are reviewed in the first of two articles on pp. 97-100.



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As we move further into the second year of this great global struggle, the job of the chemical engineer becomes crystal clear. Ours is the responsibility to produce more and better materials and weapons of modern warfare. Everywhere that there is a chance to improve a process, to save time and critical materials and manpower, there is our battlefield. There is where we can contribute most toward winning this war. Meanwhile the editors of *Chem. & Met.* pledge their best efforts to bring you helpful information on processes, plants and personnel. May we work together to the end that another Christmas will find us merrier, with happier thoughts for a post-war new year!

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CHEMICAL & METALLURGICAL ENGINEERING

ESTABLISHED 1902

S. D. KIRKPATRICK, Editor

DECEMBER, 1942

MANPOWER LESSONS FROM ABROAD

LAST MONTH at the Cincinnati meeting of the American Institute of Chemical Engineers every session involuntarily drifted toward the one subject that seemed to be uppermost in everybody's mind—technical manpower. How to stretch the available, inadequate supply to meet the increasingly urgent demands of both the war industries and the Armed Forces is a problem that worries engineers, employers and educators, as well as the governmental officials. From the Institute's several discussions came these three constructive suggestions which were respectfully referred to the President of the United States and to the War Manpower Commission:

- A. The loss of technically trained men from war production plants should be stopped immediately by cessation of voluntary enlistment or by a "freezing" order covering all such personnel and plants.
- B. Selective Service Occupational Bulletin No. 10 of last June should be reaffirmed in principle in its provisions for the deferment of men in engineering training.
- C. This directive should be modified in the light of the lower draft age by providing for the deferment of engineering students in established colleges to the end of the term in which they reach the age of 18, and thereafter, on a term-by-term basis as long as their academic records remain satisfactory.

Something closely approaching this general plan seemed to the five hundred chemical engineers there assembled as absolutely necessary if we are to maintain an acceptable level of engineering competence in war production and at the same time meet the specialized requirements of the Army and Navy for men with technical training. This plan follows, in several respects, the very illuminating experiences of both England and Canada, where similar problems have been met and solved, more or less satisfactorily.

In England, technical manpower scarcities have developed in approximately the following order: (1) engineers, (2) physicists, (3) doctors and dentists, (4) chemists, (5) metallurgists, (6) agriculturists, (7) mathematicians, (8) biologists, and

(9) geologists. There, a single department of the government—the Ministry of Labour and National Service—handles the entire manpower problem. After the Cabinet decides how many men are needed in each of the services, the Ministry decides who is to go in order that the distribution of trained manpower can be kept in balance as between the military and industrial requirements.

The same procedure applies to students who are to be given scientific and technical training and to those who are to prepare immediately for military services or for skilled occupations in war industries. For those men already enrolled in the educational institutions, a central board assists the Ministry in deciding how long such training is to be continued and for what purpose. Youngsters coming up from the secondary schools are selected, again by a national authority, but on the basis of scholastic reports and other tests of aptitude. The job is to pick those who will best repay a year or more of general training before (1) enlisting in the military services, (2) entering the war industries, or (3) embarking on the longer period of professional training.

Canada followed the same general plan when the government asked the technical societies to help it set up its Wartime Bureau of Technical Personnel, which is directly responsible to the Minister of Labour. Its job is not alone to keep the records of individuals and their qualifications (as does our National Roster) but also to organize and exercise definite control over the placement of technical personnel in the war industries. It has the authority to assign "professional engineers, chemists, research scientists, physicists, architects, and other technically trained persons" into more essential from less essential work. The individual is protected with adequate provision for adjusted compensation and the eventual reinstatement to his former position. Permits must be had from the Bureau before a technical man can make any volun-

tary change in his employment. Again there is a selection of students for advanced training at either college or trade-school level or for direct assignment to the war industries or the military services.

President Roosevelt's executive order of December 5 transferring the Selective Service System to the War Manpower Commission and giving Governor McNutt much wider powers over manpower allocation would seem to be a move in the right direction. It incorporates our recommendations to curtail voluntary enlistment and to control employment in the interest of a more logical balance in the requirements of the war industries and the Armed Forces. It provides machinery "to insure the efficient utilization of the nation's educational facilities and personnel for the effective prosecution of the war." Much depends, of course, on the subsequent issue of the necessary rules and regulations. It is hoped that they will be forthcoming promptly and will take full advantage of those features of the British and Canadian systems which have proved most effective in actual practice.

CLARIFYING OCCUPATIONAL DEFERMENT

EVERYBODY gives lip service to the idea that highly skilled persons engaged in the production of essential chemicals should be kept on that job and not allowed to go into the Army. Actually that result is not now being achieved for a variety of reasons. And, still more unfortunately, Occupational Bulletin No. 24 of Selective Service system very much muddled the waters and confused many employers as well as local draft board members.

Perhaps the most serious defect in Bulletin No. 24 was the omission of all organic chemicals from the list of important products. One would think that Selective Service did not consider any of them worthy of consideration in draft cases. That difficulty will, however, be corrected as lists of products important for the war effort are made available both to local boards and to employers seeking to keep essential persons.

A second defect almost equally serious came about through difference in use of certain terms describing "chemical operator" jobs. The intention of the committee which formulated the bulletin was excellent. They wanted to protect from premature call those plant workers who must be experienced and must have specialized skills which cannot be imparted in a matter of a few weeks or a few months. They said this fairly well and then they spoiled the whole thing by selection of illustrations. For example, they said that "contact acid operator" was not included. What they meant was the routine helpers in the contact acid plant. But what they said implies that even the most skilled men of this general class should be taken from their jobs to tote a gun. Actually taking all of such men would shut down completely the sulphuric acid plants and automatically stop a great share of all war industry.

Chemical employers must meet this situation with careful explanations to the local boards. They

must particularly emphasize that the payroll title is not the governing consideration. They must explain the degree of skill and the length of experience or training required. It is going to be hard to get all local boards, overworked as they are, to ignore the payroll label of these workers. But it is a job that must be done if we are going to keep on manufacturing at capacity in essential chemical business.

Every employer should make a careful inventory of his personnel, classified by position and responsibility, age and number of dependents. It is extremely important that the kind of work and skill involved be presented clearly.

HARRISON E. HOWE, 1881-1942

THESE pages were already on the press when we received the shocking news of the sudden passing of our dear friend and contemporary who since December 1, 1921 has so ably guided the Editorial destinies of *Industrial & Engineering Chemistry*. Doctor Howe was a true friend of the entire chemical profession. He held high its moral and human as well as its scientific standards. He contributed greatly to the advance of technical journalism for his influence was felt far beyond the field of industrial chemistry. Many, many times he answered the call for interpretation, guidance and leadership as the public interest demanded an authoritative spokesman for scientific research and development. Thus he will be sorely missed outside as well as within the ranks of the chemical industry and profession. His place in the affairs of the American Chemical Society will be difficult to fill. But the place he held in our hearts will always remain a cherished memory.

PURELY COINCIDENTAL?

SOMETIMES we think of wars as so destructive that they cast a blight on all technical progress. Possibly the reverse is true. In any event, there seems to be an interesting relationship between the chronologies of war and certain important chemical and chemical engineering developments. For example, Priestley's discovery of oxygen preceded our Revolutionary War by only a matter of months. In 1790 the LeBlanc soda process was the French reply to the British blockade during the Napoleonic Wars. The continuous chamber process for sulphuric acid was developed in 1812. In 1846 gun-cotton was first made by Schonbein. The Solvay ammonia process was developed in 1865. The contact process for sulphuric acid was first patented during the Spanish-American War of 1898. In the same year Herbert H. Dow made bleaching powder in the United States from electrolytic chlorine produced in his own type of cell. Haber perfected his synthetic ammonia process in 1913-14 so that Germany could start World War I. In 1915 Chaim Weizmann developed the fermentation process for the production of acetone and butanol. This paved the way for the low-viscosity nitrocellulose development that gave us the modern

lacquer industry. Nylon came on the American scene just before World War II got under way in Europe. 1942 saw a tremendous American production of magnesium from sea water. In 1943, —?

A WELCOME PATENT POLICY

SECRETARY OF INTERIOR ICKES announced on November 25 that "ownership and control of any inventions developed by Interior Department employees on government time or with government equipment hereafter will be assigned to the Federal government." This is the only proper and honest plan of procedure. It is not at any time proper for public officials to exploit privately for their own gain the results of their professional activities which have to do with their government jobs.

This policy has long been in force in some of the other government departments. Its adoption in the Interior Department years ago was urged but denied. Some of the difficulties of dealing with the Department of the Interior have resulted from the delay in the fixing of this policy. Industry executives will be happy to know that Mr. Ickes has im-

posed on his department such a regulation of general application. For years many of the individuals in the department have voluntarily followed this practice. But there were just enough of the other kind of cases to make some dealings between outsiders and the Bureau of Mines, for example, of the sort that involved uncertainty or actual financial controversies.

TRULY A WAR CASUALTY

THOSE of us who knew him personally realize that the late William S. Farish was, as Mr. Boyd of A.P.I. has well said, "truly a war casualty." He drew heavily on his declining physical strength to serve courageously in the best interests of his country. The petroleum industry recognized him as an outstanding leader and a most able executive. But few outside of his intimate acquaintances knew that he was a poor Mississippi boy who had worked his way through college and later through law school to become the head of the largest corporation in the world. This could only happen in the America he loved so dearly.

WASHINGTON HIGHLIGHTS

AMMONIA supplies in the post-war period will be super-abundant. No one knows what we will do with so much potential fertilizer material when most explosives making stops. But a joint study is being made by the Department of Agriculture, the organized agronomists of the country, and the fertilizer industry. During November there was a conference which formally organized this committee which will study means for post-war nitrogen utilization. Anyone who has any ideas for expanding consumption in fertilizers, or for other industrial application, will do well to communicate with the secretary of the new committee, Mr. H. R. Smalley, National Fertilizer Association, Washington.

PRICE INCREASES made necessary by wage and salary changes generally require official approval. O.P.A. has set up rather complete regulations for the procedure involved when price ceilings must bulge to prevent hardship. It is obviously also the intention to use price ceilings for preventing wage and salary increases wherever possible. This is a measure of inflation control. Only when the boss is willing to take salary increases out of his profit does the government ignore such changes, and not always even then. Although initial regulations released on No-

vember 18 do not apply to everybody, there is an increasing tendency to spread the application of these rules as far as possible, even to small employers and to activities where price ceilings and other regulation have not previously gone.

TARIFFS by edict, and many other administrative changes affecting movement of goods and persons across our boundaries, would have been possible under the requested legislation which the Ways and Means Committee declined to foster. But it is a serious mistake to assume that the President is not going to have plenty of power to do every necessary thing for control of international movements of interest to this country. He probably could do everything requested in the bill which failed to start well, by working merely under the War Power Acts. Some old-school observers who gloated at the defeat of the proposed measure apparently do not understand these facts.

BUILDING MATERIALS that are abundant, relatively, must be substituted for the scarce types. Thus gypsum products, cement products, and many other special materials are being promoted by the government to replace metal and lumber. Chemical engineers in planning new construc-

tion must remember that many types of lumber are now almost as difficult to get as metals, strange as that may seem.

PROMOTION that is well deserved has advanced Ernest W. Reid from chief of the former Chemical Branch of W.P.B. to the post of director of the new Commodities Bureau. Equally deserved is the advance of D. P. Morgan from deputy branch chief to the position of director of the Chemical Division. The planning and leadership of these men has made chemical supply for war purposes more nearly adequate than the supply of almost any other important group of strategic commodities.

W. W. SKINNER, long associated with the Bureau of Agricultural Chemistry and Engineering, has been named chief, filling the vacancy caused by the death of Dr. Henry G. Knight in July. This is a logical and commendable selection. It means that the Bureau can carry on with the minimum of shock following the loss of an able leader. And it is a well deserved recognition of the long and distinguished career of Dr. Skinner who has probably done more than any other single individual to bring the Bureau to its present position of prestige and great public service.

Mobilizing New Technology for War Production

SIDNEY D. KIRKPATRICK *Editor of Chem. & Met.*

Chem. & Met. INTERPRETATION

The Office of Production Research and Development recently established in W.P.B. should help to bring a fuller impact of science and engineering to bear on the production problems of the war industries. To date there has been little or no coordinated effort in this direction despite brilliant work being done in some divisions and sub-divisions of W.P.B. and by some outside agencies. Likewise adequate financial support has been lacking, especially for the construction of pilot plants for the large-scale demonstration of meritorious processes. Nor has there been any over-all policy regarding the use of university and industrial research laboratories and developmental facilities for studying war production problems. If the new O.P.R.D. can adequately serve these needs, there may be no necessity for additional legislation. Meanwhile, however, several bills are before Congress which would call for mobilization—perhaps regimentation—of all technological resources, human and material.—*Editors.*

WAR is a business. So far the production department's job has been to turn out the largest volume of goods in the shortest possible time. Materials and manpower, rather than money, have been the limiting factors. With the Armed Forces, Lease-Lend, and the Maritime Commission all clamoring for increased output by the war industries, quantity has sometimes counted for more than quality. Now, however, we are reaching the stage where quality really counts. We need a research and development department to mobilize the creative functions of science and engineering in the war effort. We need new techniques, new ingenuity, and resourcefulness, if we are to produce new and better weapons of war in ever-increasing amounts.

The opportunity for just such a mobilization of technology is seen in the recent appointment of Dr. Harvey N. Davis to head the new Office of Production Research and Development in W.P.B. According to Board Chairman Donald M. Nelson, this agency is to parallel in the production field the extensive scientific research and development work being done on the actual instrumentalities of war through the Office of Scientific Research and Development headed by Dr. Vannevar Bush.

The latter organization, created by Executive Order No. 8807 of June 28, 1941, has already mobilized perhaps five thousand scientists and engineers, and through the National Defense Research Council, is administering approximately a thousand no-profit, no-loss research contracts. Most of these have been placed with universities and colleges throughout the country, although a number have been made with industrial laboratories. The exact nature of the work being done by N.D.R.C. is among the deepest of our war secrets, but it is primarily concerned with the origination and improvement of the actual weapons of war.

Prior to the appointment of Dr. Davis there was no single comparable technical agency concerned with war production problems. An unsuccessful attempt had been made last Spring to set up an Office of Technical Development in the W.P.B. division of governmental requirements, but the effort failed largely through lack of technical direction and support. Meanwhile, many of the industry and commodity divisions and sub-divisions of W.P.B. had developed their own ways and means of bringing scientific and engineering assistance to bear on their particular problems.

The metal and mineral divisions,

working largely through Dr. C. K. Leith of the University of Wisconsin, as W.P.B. technical consultant, had set up a cooperative arrangement with the National Academy of Science and the National Research Council to prepare technical reports on a wide variety of products and processes. More than a hundred reports, such as the one on alumina which was abstracted in *Chem. & Met.* for September, 1942 (pp. 138-40), were prepared under the general direction of the War Metallurgy Committees headed by Clyde Williams, director of Battelle Memorial Institute.

The chemical division, after working closely with a group of about fifteen advisory committees originally set up in June, 1940, by the Chemical Alliance to serve the Army and Navy Munitions Board, organized its own Referee Board to pass technical judgment on competing processes. Under the chairmanship of Dr. Donald B. Keyes, of the University of Illinois, this committee is composed of a group of twelve chemical and chemical engineering consultants and university department heads (see *Chem. & Met.*, August 1942, p. 129).

Meanwhile, too, ideas have been pouring into the National Inventors Council of the Department of Commerce at the rate of 300 to 400 a day and, except for preliminary evaluation by its own staff, there has been no well-organized machinery in W.P.B. for handling those inventions that might directly benefit war production. Likewise, hundreds of independent industrial and university research laboratories, engineering experiment stations, etc., have offered their services to W.P.B. and other war agencies, but often without any takers.

In announcing the appointment of Dr. Davis on Nov. 9, 1942, to serve as Director of the O.P.R.D., Mr. Nelson outlined four principal functions of that office, as follows:

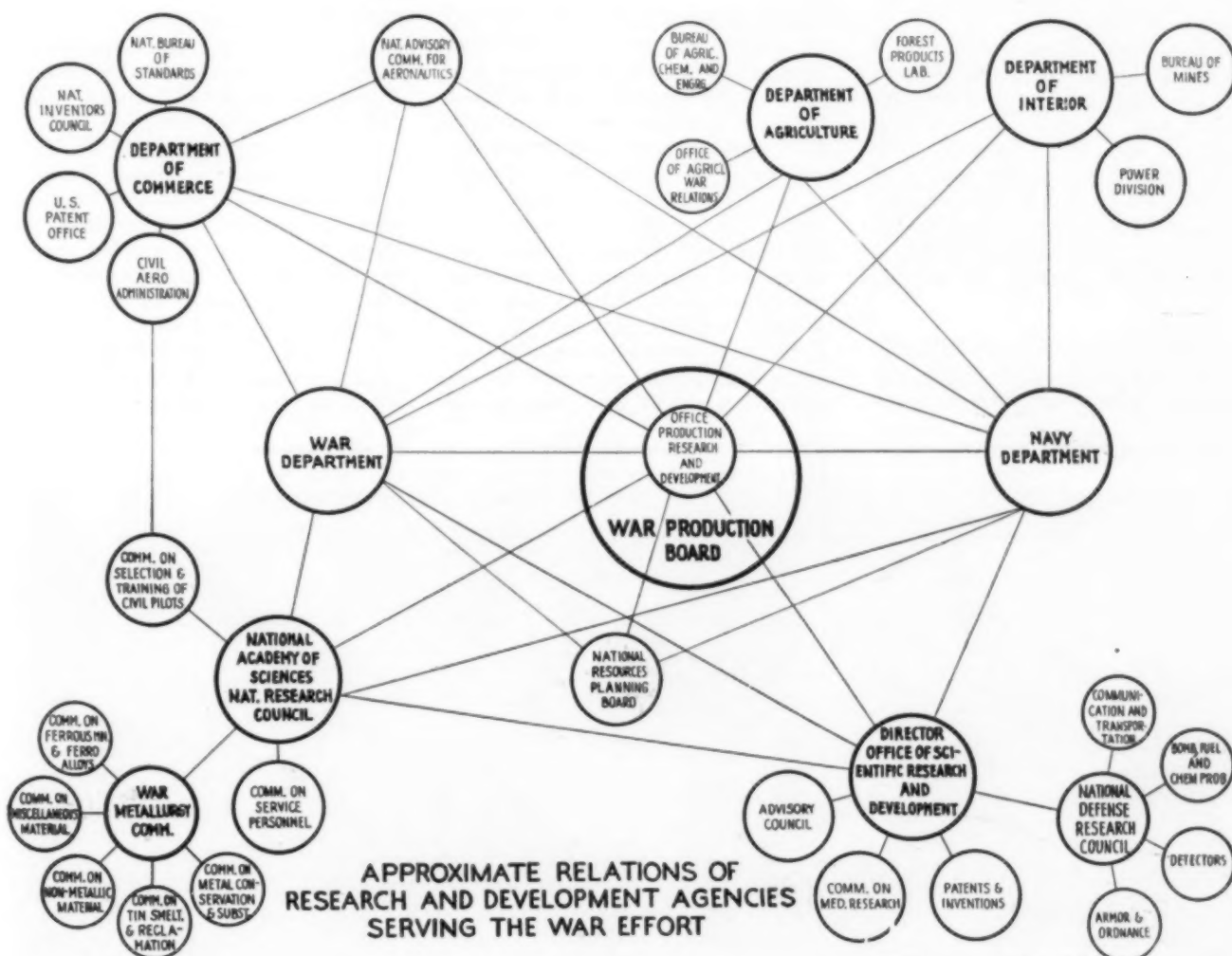
1. To provide the chairman with technical information on problems with which he is directly concerned, and on research and development work now in progress in W.P.B. The office is also to provide the W.P.B. divisions and

2. To initiate evaluation and analysis of specific scientific or technological proposals, through the establishment of expert committees or through reference to existing research groups in government, education or industry.
3. To get needed research accomplished by contracting with outside laboratories or agencies for experimental work.
4. To bring about development of such projects or processes as are found to merit it through contracting for the construction of prototypes or the erection of pilot plants.

While the Office of Production Research and Development was being organized within W.P.B., several legislative proposals have been before various congressional committees. Senator Harley M. Kilgore, of

Still another legislative proposal would go still farther and take over

Few believe that these drastic proposals have a chance of passing Congress, at least in their present form. But it is significant that they are receiving increased interest and support. Mr. Nelson himself appeared Nov. 18 before the Subcommittee on Technological Mobilization and declared that "there is a great deal of good" in the Kilgore bill. He sees a "tremendous need for all-out technological mobilization in many directions . . . not alone from the standpoint of chemistry and physics, but of mechanics as well, and the development of new weapons."



Emergency Repairs for Gas Mains

G. S. GOLDSMITH *Engineer of Distribution, Brooklyn Union Gas Co., Brooklyn, N. Y.*

Chem. & Met. INTERPRETATION

Before the War, gas companies were well equipped to deal with the ordinary hazards of their business, but the possibility of bombing raids, with consequent widespread damage to mains, introduced new problems for which there was little precedent prior to the British experience in 1940-41. Since that time much attention has been given to emergency repair methods, many of which will be equally useful for large industrial producers and consumers of fuel gases. These methods are commended to their study.—*Editors.*

THREE MONTHS before the tragedy of Pearl Harbor, distribution engineers in our company began thinking about what we would do about shutting off the gas flow and making emergency repairs to gas mains if a severe bombing raid disrupted our service.

Valves have always been provided on all high-pressure mains to shut off the gas, but on low-pressure mains the expense of installing valves at each street intersection is so great that temporary means of gas shut-off are used. The customary method is to drill a hole in the top of the pipe through which a rubber bag is inserted and inflated

with air; or a similar device, known as a "stopper," may be used in place of the bag. Either of these devices will withstand the few inches of water-column pressure that is usually found in low-pressure mains.

During peace-time such a method of shutting off the gas is practical because in almost every case the main to be stopped off is exposed in the trench and easily accessible. If a cast-iron main does break, the rupture is circumferential and only a small crack results. Since the main is 3 ft. under the surface of the street and completely surrounded by well packed soil, the escaping gas is so greatly retarded that only a small quantity will find its way to the surface for detection. In such cases it is necessary merely to expose the main at the break, install

a clamp and back-fill, with no interruption of service.

In war-time, however, when the possibility of bombing is always present, other methods must be developed, because an exploding bomb in the street will remove a large section of the main, thus permitting gas to escape in large quantity from each end of the severed pipe. Furthermore, as gleaned from the experience of England, the gas is almost sure to ignite.

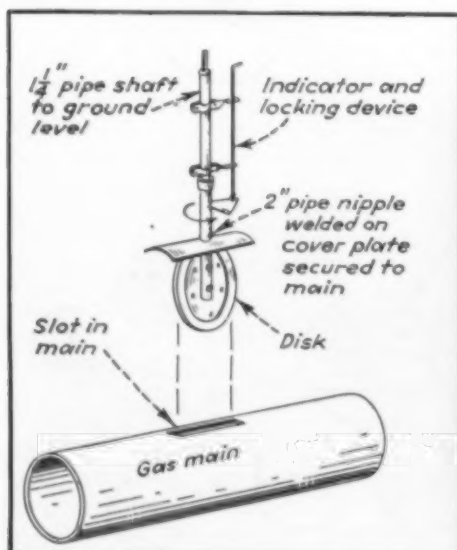
The more important of these shut-off methods include: (1) Butterfly control valve; (2) conical plug or stopper; (3) plastic materials; and (4) inflated bag.

BUTTERFLY CONTROL VALVE

A device developed by the San Diego Gas & Electric Co. of California is used as an emergency shut-off on low-pressure gas distribution mains from 4-in. to 30-in. diameter. Essentially, the device consists of a disk, similar to a stove pipe damper, which can be rotated 90 deg. inside the main. To obtain a good seal against the inside wall of the pipe the periphery of the disk is faced with discarded garden hose or similar tubing. Another method consists of a sheet of $\frac{1}{4}$ -in. rubber between two metal disks.

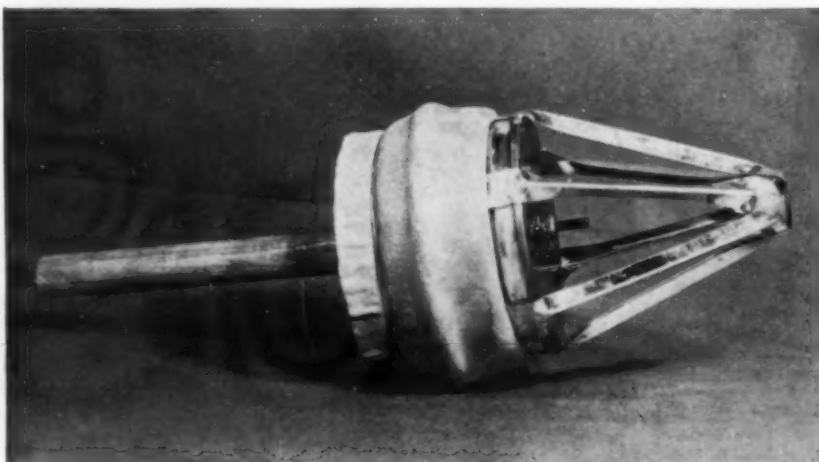
The disk is inserted through a longitudinal slot which has to be cut in the top of the gas main. A

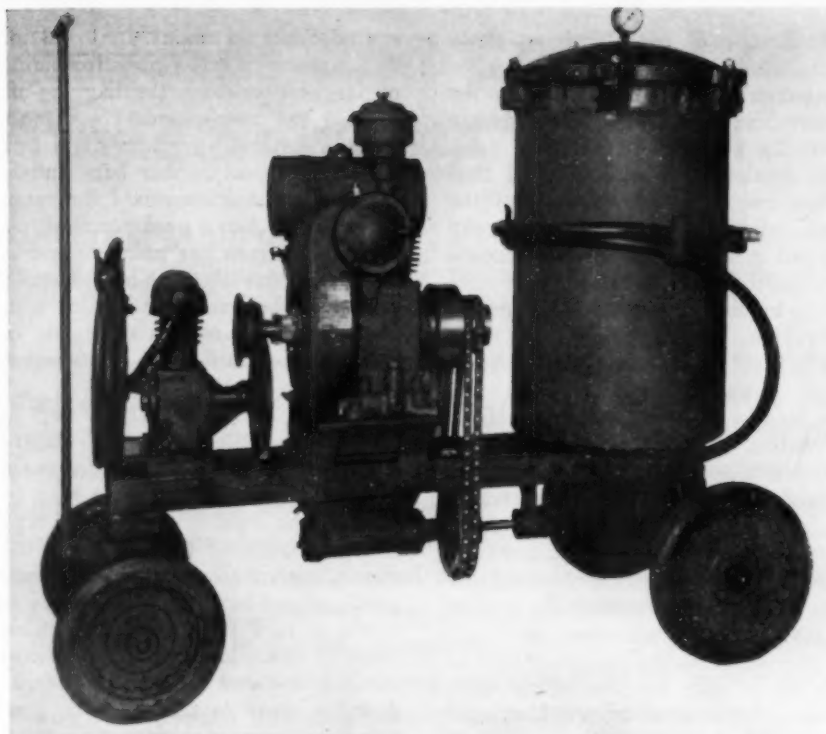
Condensed slightly from the paper presented by the author on Dec. 3 before the Manufactured Gas Committee of the Process Industries Division, American Society of Mechanical Engineers, at the Society's annual meeting in New York.



Left—Butterfly control valve for emergency shut-off, developed by San Diego Gas & Electric Co. of California

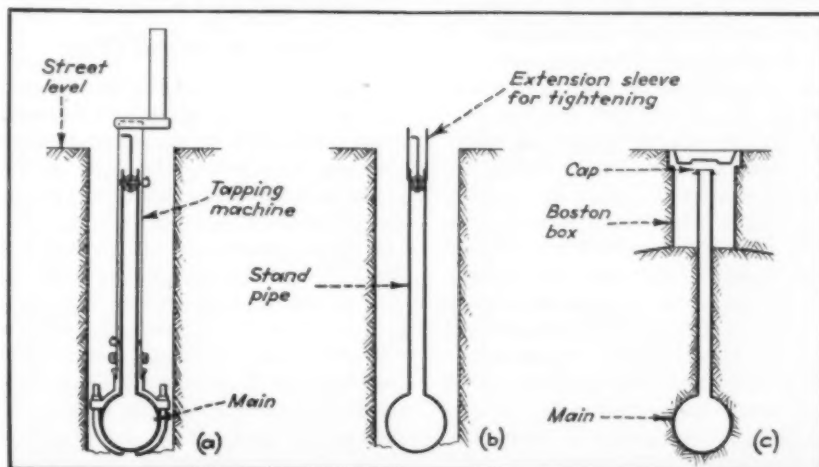
Below—Brooklyn Union Gas Co.'s conical plugs for broken mains are best suited for mains up to 12 in. diameter





Above—This machine, first conceived by Philadelphia Gas Works Co., plugs a main by pumping in a heavy "plastic"

Below—Three steps in installing a standpipe in a main, through which a rubber bag can be inserted for blocking

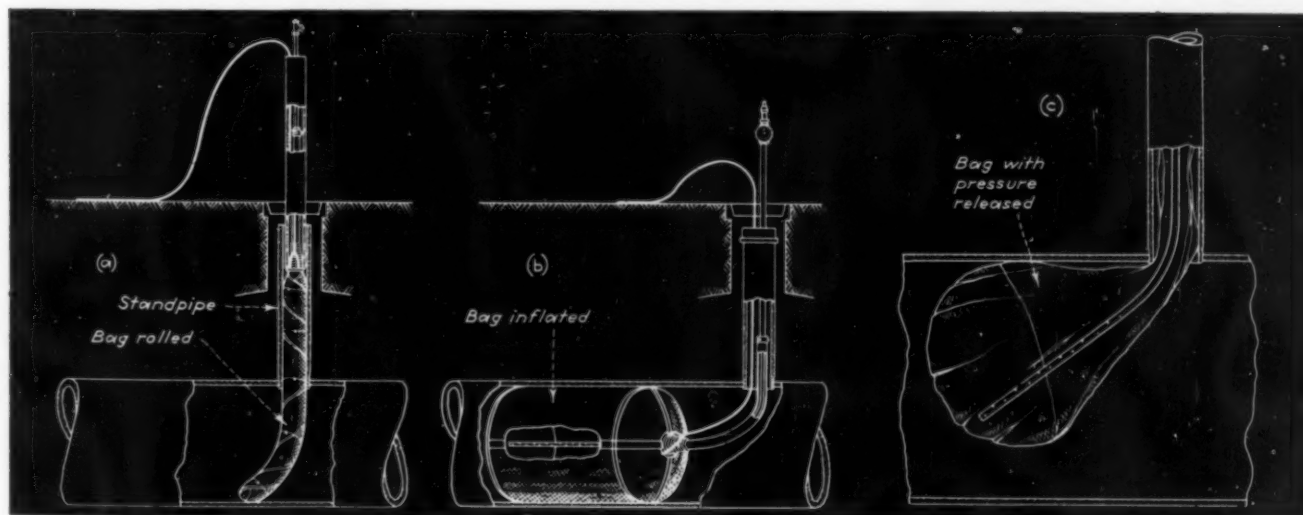


cover plate is then bolted or clamped to the main to seal the slot. A rod or shaft is fastened to the disk and extended upward through a stuffing box and into a receptacle placed in the pavement so that the valve may be operated from street surface.

CONICAL PLUG OR STOPPER

Where the ends of the broken main are exposed and not covered up with debris, conical plugs are felt to be the simplest and most practical method of shutting off a main. To date the most satisfactory design has been a plug with a can-shaped body made of 32-gage crimped tin plate and a 26-gage head for added rigidity. Cone-shaped vanes are attached to the head of the can to aid in guiding the plug into the main. The can-shaped body has a concave bead drawn around the periphery at each end of the plug, which serves the double purpose of strengthening the plug and providing a means for fastening a leather sheath. This leather sheath (made of meter diaphragm leather) is draped on the outside of the plug body over a piece of $\frac{3}{4}$ -in. O.D. gum rubber tubing, located between the two beads, and the leather is then lashed to the can body. The maximum diameter of the plug is small enough so that the entire plug can be pushed into the main and thus obtain a shut-off despite the ragged broken edges of the pipe. A heavy coating of grease or soap put on the leather portion of the plug insures an effective seal. Plugs of this type have been designed

Below—Three steps in the use of an inflated rubber bag for sealing off a large-diameter, low-pressure main: (a) inserting the folded bag; (b) bag inflated; (c) bag being withdrawn



and built for mains up to 12-in. in diameter.

The plug is fastened to a wooden pole of sectional construction (and hence, of variable length) by means of a strong flexible joint. This flexibility is necessary in order to allow the man handling the plug to stand on the edge of the crater rather than in front of the broken main, and thus avoid to a great extent the issuing gas, or flames if the gas is burning. The pole can be extended to any length required by merely adding sections. The flexible joint and the construction of the plug permit the plug to align itself properly inside the main, regardless of the angle at which it is introduced. The plug, of course, may be left in the main and the handle removed until it is convenient for permanent repairs to be made.

The weight of the plug at the end of the pole is supported by a cable that is carried by two men walking on opposite edges of the crater. In this way the man carrying the pole is relieved of the dead weight at the end of the pole and the operation is carried out much more smoothly and accurately.

Another type of plug, one that has been used extensively in England, consists of a metal cone followed by a rubber disk. The disk is made of discarded conveyor belting cut to the inside diameter of the pipe and the edge is chamfered so that it can be inserted easily. Tests show, however, that the seal effected by this type of plug is not nearly as good as that obtained with the can-shaped plug.

PLASTIC MATERIALS

Since the premises of every gas consumer is connected to a gas main somewhere out in the street, ready access to the interior of a main may be had through the small pipe known as a "service," which leads from the main to the premises.

The Philadelphia Gas Works Co.,

who first made use of this set-up to plug off a main, gained access to a consumer's cellar, disconnected the meter and pumped a heavy grease into the main via the service pipe. The method was so successful that other gas companies picked up the idea, improved upon it, and thereby gained a simple but effective means of shutting off a low-pressure gas main in case of bombing damage.

Various types of pumping units have been tried, most of which have been powered by compressed air, gas engine or electric motor. Hand operation of a pump is too slow to be effective. We use a self-contained unit in which all the essentials are combined. A 24-hp. gasoline engine drives a piston-type pump and also a small air compressor to assist in feeding the grease to the pump by air pressure.

In operation, the pumping unit is placed as near as practicable to a cellar door or window, a rubber hose is connected between the pump and the consumer's end of the service and a sufficient quantity of plastic material is pumped into the main to seal off the gas flow. The whole operation requires about five minutes on a 6-in. main. If a heavy grease has been pumped into the main it is difficult to remove, and for that reason other plastic materials have been tried which will lend themselves to later reduction either by heat or a solvent. One such material, a heavy wax, is available which may be thinned to the right consistency and pumped into a main as readily as grease. Hot water or steam will not only quickly melt the wax, but will hold it in suspension. Once it is dissolved in water it remains dissolved until the water is completely evaporated, by which means the wax may be reclaimed.

INFLATED BAG

The methods of sealing off low-pressure gas mains by means of conical plugs or plastic materials

are adequate on mains up to 12 in. in diameter. On low-pressure mains of larger diameters, the bagging-off method has to be used.

As mentioned previously in this paper, spherical rubber bags inflated with air have been used for years and are still being used for shutting off low-pressure gas mains in regular peace-time operations. Rubber bags may be used in war-time also if certain preparations are made in advance to permit the bags to enter the mains quickly.

Briefly, the preliminary set-up is to install standpipes in the larger-size low-pressure mains at intervals of three or four blocks and then to modify the rubber bags to adapt them for entering the mains via the standpipes. After such preliminary preparations have been made and a bombing raid occurs, during which some of these large mains are fractured, it becomes a simple matter to dispatch crews to the incidents, provided with the necessary equipment to insert the bags quickly down through the standpipes, inflate them with air, and thus close off the ruptured mains.

STANDPIPE INSTALLATION

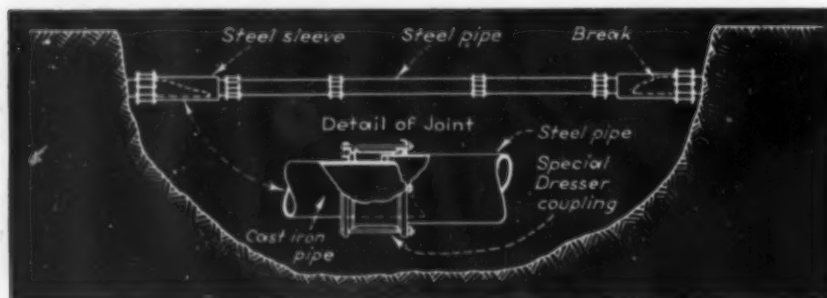
Since hundreds of standpipes must be installed, this procedure becomes very expensive unless some method is evolved to install the pipes in the tops of the mains without excavating large openings in the street. We therefore developed a drilling and tapping machine (diagrammed on the preceding page) which will operate in an opening just large enough to admit the machine. This device operates with compressed air and will drill and tap a hole in the top of a gas main 3 ft. below street level in one operation (sketch a). The drill and the tap are then withdrawn and a length of pipe of the required diameter is inserted down through the machine and screwed into the top of the main without the escape of gas (sketch b). The machine is then removed, the opening is backfilled with dirt, a Boston box is installed, and the standpipe is ready for use in any emergency (sketch c).

EMERGENCY REPAIR

After the flow of gas has been stopped by any of the described methods the next concern is how best to restore the ruptured main for the resumption of service. Here again our peace-time methods are not applicable because they are too

(Please turn to page 87)

Method of bridging a long gap in a broken main using steel pipe and special couplings of a type shown in the detail drawing



Hazards and Control of Industrial Toxic Solvents

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Chem. & Met. INTERPRETATION

The probability of chronic poisoning is often ignored by many technical men. This may be due to faulty training as well as to the concentration of literature in journals not widely read by chemical engineers employed in industry. However, especially in such times as these when industrial solvents are being used on an unprecedented scale and often by inexperienced and untrained personnel, it would be wise for every plant engineer to pay particular attention to the possible hazards from these chemicals. Herein the author outlines the symptoms of solvent poisoning as exemplified by benzol, occurrence of exposure and engineering control methods.—Editors.

THE NUMBER of industrial solvents is so large that only one typical material, benzol can here be discussed in detail. A more general article would be limited to a list of the various solvents with an incomplete description of their properties. In this article, benzol has been selected as the typical example. Other solvents, of course, have different properties, but the methods of control are essentially the same for all.

While the volatility and toxicity of such materials as benzol, carbon disulphide, carbon tetrachloride, or trichloroethylene may vary, the following general control measures should minimize the hazards from all these solvents:

- (1) Obtain complete analyses of materials used.
- (2) List all compounds used.
- (3) Check list for toxic materials.
- (4) Study operations where toxic materials are used for possible employee exposure.
- (5) Determine the concentration of toxic materials in the air.
- (6) Bring toxic concentration within safe limits by substitution, enclosure, or exhaust.

This is last of a series of articles designed to acquaint the chemical engineer with the hazards and prevention of chronic poisoning in industrial chemical operations. "Combating Chronic Poisoning in Chemical Operations," dealing with general principles, appeared in August; "Preventing Heavy Metal Poisoning in Industrial Operations," appeared in September and "Silicosis: Occurrence and Control" in November.—Editors.

(7) Check efficiency of control by periodic physical examinations.

(8) Physical examinations should include examination of blood and urine.

It is unfortunate in the case of benzene that even the name of the material should contribute to the hazard. Benzene is the name given to the coal tar derivative which is toxic. Benzine is the name given to the petroleum derivative which is comparatively non-toxic. The confusion resulting from this similarity of names has often caused both unsuspected exposures and also unnecessary concern about nonexistent hazards. In order to avoid this confusion some people refer to the coal tar product as benzol, and in this article we will conform to this practice.

Benzol is a colorless liquid with a distinctive odor. The boiling point is 80.1 deg. C. and the refractive index is 1.5016. It is inflammable, and in addition to the toxic hazard, the fire and explosive hazard of this chemical should also be kept in mind. The material freezes at 5.5 deg. C. and will flash at 10 deg. C.

Although this article deals principally with chronic poisoning, benzol also acts as an acute poison. In contrast to silica or to the ordinary exposures to lead, death may result after a short exposure to benzol. In one case a man was found dead twenty minutes after entering a still which had contained benzol, al-

though the still had been emptied and washed out.

Fatal cases have also been reported from repair work on benzol stills, from leaks in stills, and from failure of the cooling water in the condensing unit on stills.

SYMPTOMS OF POISONING

The symptoms of acute benzol poisoning, according to Greenburg¹, are faintness, dizziness, headache, apprehension of death, tremor, rapid pulse, cyanosis, collapse, coma, acute mania, or delirium preceding sudden death. In very high concentrations, death may result from respiratory paralysis.

Concentrations of 13,000 parts per million will kill dogs in twenty minutes. However, 1,500 to 3,000 parts per million can be borne for six hours without serious symptoms insofar as acute exposure is concerned.

The following three cases have not been previously reported. In the first case, a man lifted the cover from a vessel containing benzol heated to 120 deg. F. He shouted to another man and collapsed across the vessel and was dead before he could be removed to a safe location.

The second case concerned a laboratory worker who had used rather moderate amounts of benzol in certain extractions. This man died about five hours after leaving work. The third case concerns a man who used benzol in large quantities to remove tar from his body after cleaning a tank. He did not die, but was very sick for several days.

In acute poisoning it is not unusual for the patients to recover completely, if they recover at all. The fourth case involved an accident from benzol resulting in the loss of sight. In this instance a woman was using a rubber cement containing 90 percent benzol. In squeezing the tube containing the cement she forgot to remove the cap and the cement came out of the back of the tube and struck her eye. Although medical attention was given shortly afterward, the woman lost the sight of the eye. This case is mentioned because it is be-

lived to be one of the first of its type.

Table I gives a list of the toxic limits of a number of industrial solvents. It will be noticed that on this particular list the maximum allowable concentration for continued exposure is 75 parts per million. In addition to this, Hunter¹ states: "It is doubtful whether any concentration of benzene greater than zero is safe over a long period of time." Dr. Hunter bases his conclusions on two fatal cases which tend to substantiate his contention that the maximum allowable concentration of 75 parts per million is too high.

The first case was that of a man who had worked as a cobbler for twenty years. An analysis of the air indicated concentrations of benzol less than 25 parts per million from benzol and benzol-containing cement. This patient died in spite of the low concentration, and an autopsy confirmed the benzol diagnosis.

The most unusual case was that of a telephone operator who used benzol to clean off her switchboard every evening. Although the concentration was estimated at less than 10 parts per million, she was treated for some time for anemia and finally died.

According to Greenburg, the symptoms of chronic poisoning are headache, loss of appetite, burning of the eyes, nausea, vomiting, general weakness and damage to the nervous system. There are also marked blood changes.

PHYSIOLOGICAL ACTION

It is difficult to explain the action of benzol without the use of medical terms, which are not of interest to

most chemical engineers. For our own purposes we consider the action as being one of very marked effect on the blood. This effect may be anemia, which is the most common and generally accepted idea of its action. The action may, however, be a decrease or increase in white cells, or an increase or decrease in the size of the cells. In old cases, the spleen may be enlarged.²

Benzol poisoning may also appear with an infection some time after the exposure has stopped. In this it is similar to lead, although the cause is different. In the case of lead, the bone was a storage place and with an infection there was likely to be a discharge of lead into the circulating blood stream. In the case of benzol, the action is to impair the function of the bone marrow in forming new blood cells. According to Hunter this damaged marrow can function during health, but produces an erratic blood condition during even a mild infection.²

OCCURRENCE OF EXPOSURE

Industrial exposure to benzol may be divided into two types: those exposures in which the user knows that he is handling benzol, and those in which the exposure is not known. The first group includes the manufacture of benzol by distillation of coal tar and its use in large chemical plants. In addition to the fact that the operators know of the hazards, the operations are very likely to be carried out in a closed system.

Determinations on air samples from one company that used thousands of gallons of benzol daily for blending with motor fuel indicated a much smaller exposure to this solvent than a small paint shop that used only five gallons a day in a paint remover. In the case of the blending plant, the operators knew the material with which they were dealing and how to avoid unnecessary exposure. Periodic urine sulphate determinations were made to detect any unsuspected absorption. In addition, the benzol was handled by pumping from tank to tank and there was little need for any actual contact by the employees. The highest value for exposure was 50 parts per million of benzol.

In the case of the paint shop using the benzol paint remover, the management did not know that there was any benzol in the plant. In addition, they did not seem to be concerned if there was such a benzol exposure, and it was necessary to convince them that exposures to 300 parts per

million of benzol were dangerous. The type of exposure where benzol is being handled by men with experience should give us little concern. On the other hand, the cases in which the exposure exists without the knowledge of the workers are likely to give the most trouble.

An example of the type of difficulty which results from using solvents about which nothing is known is the following case history. The company concerned branched out into the manufacture of phonograph records. In part of the process as they carried it out, the hot record was dipped into a solution designated by a trade name. The record was then dried and cooled by a blast of air which was warmed by the cooling records. In order to conserve heat this warm air was used to heat one small department. The result was that one man was dead in about three months, and several others made ill. The firm that supplied the solvent had given no indication of any possible harmful effects from its use. The solvent proved to be 30 percent benzol and the trouble resulted chiefly from ignorance of exposure. In a good many cases trouble results because of faulty specifications by the purchaser.

One group of cases occurred in printing shops doing rotogravure printing. A fast drying ink containing a high percentage of benzol was supplied to the print shops. Several men died before the cause was traced to the benzol content of the ink. In the manufacture of artificial leather there have also been recorded a number of fatalities from benzol. The use of paint removers can be a source of considerable exposure.

The rubber industry has also had a number of benzol cases. These exposures were due to the excellent solvent properties of benzol for rubber. The cementing of crepe rubber soles on shoes gave estimated concentrations of 500 parts per million, and a large number of cases resulted in a short time. One of these was fatal after six months of illness.³

DETECTION OF BENZOL

In the control of the hazard, it is important to determine the benzol concentration. This can be done by forming dinitrobenzene and then adding butanone, which gives a typical color reaction. The color thus obtained can be compared with color standards to arrive at the concentration of benzol. The method is quite sensitive and for a concentration of 25 parts per million it is only neces-

Table I—Maximum Concentration of Toxic Solvents as Suggested by the State of Massachusetts¹

| Gas or Vapor | P. P. M. |
|-------------------------------|----------|
| Amyl acetate..... | 400 |
| Aniline..... | 5 |
| Benzene..... | 75 |
| Butyl acetate..... | 400 |
| Carbon bisulphide..... | 15 |
| Carbon tetrachloride..... | 100 |
| Dichlorobenzene..... | 75 |
| Dichloroethyl ether..... | 15 |
| Ether..... | 400 |
| Ethylene dichloride..... | 100 |
| Formaldehyde..... | 20 |
| Gasoline..... | 1000 |
| Methanol..... | 200 |
| Monochlorobenzene..... | 75 |
| Nitrobenzene..... | 5 |
| Sulphur dioxide..... | 10 |
| Tetrachlorethane..... | 10 |
| Tetrachlorethylene..... | 200 |
| Toluene..... | 200 |
| Trichlorethylene..... | 200 |
| Turpentine..... | 200 |
| Xylene, coal tar naphtha..... | 200 |

1. Bowditch, Drinker, Haggard & Hamilton, *Jour. Ind. Hygiene & Tox.*, 23, No. 6 (June, 1940).

Table II—Physiological Response of Man to Various Concentrations of Benzol

| For Cases of Acute Poisoning ¹ | | | |
|---|-------------------|--------------------|---------------------------------|
| Milligrams per Liter | Parts per Million | Length of Exposure | Effect |
| 5-10..... | 1,570-3,130 | Several hours | Slight symptomatology |
| 10-15..... | 3,130-4,700 | One hour | Possible serious symptomatology |
| 61..... | 19,000 | Short exposure | Fatal |

¹U. S. Dept. of Interior, Bureau of Mines, *Technical Paper 273* (1921).

sary to take a 500 c.c. sample of the air.

In this procedure, the air sample is pulled through a bubbler containing equal parts of concentrated sulphuric acid and fuming nitric acid. The acid is neutralized, and butanone is added to the warmed solution. After shaking, the butanone is separated and placed in a colorimeter tube with additional caustic for comparison with the standard.*

CONTROL METHODS

In Massachusetts, it is required that material containing over five percent benzol be labeled, and also that there be included a printed caution that it is poisonous. It is compulsory that any container used for benzol either for shipping or in the plant, be so labelled. This seems to be a very excellent control method and it is very difficult for unsuspected cases of benzol exposure to exist when this system is used. However, it does seem to be a bit unfair that benzol should have to be labelled, while other solvents such as the chlorinated hydrocarbons are not included.

It would be desirable insofar as the prevention of benzol poisoning is concerned, if all states had a law similar to that of Massachusetts, but there is no evident reason why this law should apply only to benzol. The practical possibility of getting an all-inclusive labeling law for all toxic materials is remote. It is desirable both from an economic as well as from a safety standpoint either to request an analysis of trade name products or to have an analysis made.

One of the steps in occupational disease control is to set up a card index of all the materials used in the plant. It is sometimes found that a good many materials being used have rather meaningless trade names. If the suppliers will not give information regarding the analysis and it is difficult to obtain one, it may be possible to obtain a guarantee that there is nothing harmful in the purchased material.

When information is requested about solvents, it is sometimes found that the supplier himself knows nothing about the product he is sell-

ing. The supplier merely uses a trade name material as one ingredient without knowing what it contains. A list of every material used in a plant with its composition is a great control measure; the consideration of the safety angle by the purchasing department is another very important control measure. When materials are being purchased, consideration should be given not only to the quality and price, but also to the cost of the precautions necessary to use the product safely.

Engineering methods of control of benzol hazards are the same as those suggested on the other types of exposure, such as the dusts. If it is possible to use a non-toxic material to replace the hazardous one, this may be a simple way out of the difficulty. This method of substitution is not as simple as formerly, due to difficulties caused by the war. It was at one time considered good practice to substitute toluol for benzol, but due to the demands of the munitions industry this is not possible at present. Inasmuch as there is no solvent which will compare with benzol in solvent properties and which is neither toxic nor very flammable, the problem of substitution is not a simple one.

If substitution is to be made, the process should not be changed to counteract the substitution. In one case, for example, substitution was made of a chlorinated hydrocarbon for benzol which made a theoretical improvement in the toxic hazard. However, in order to get better results, the plant process was changed so that the new material was heated, causing a higher concentration in the air. The increased concentration more than made up for the lower toxicity.

Enclosing operations or covering any containers will prevent the escape of the vapor into the air. On operations where it is not possible to completely cover the work, local exhaust hoods are the solution. It is much better to use local exhaust hoods which remove the vapors at the point of origin than to use general ventilation. On enclosed operations it is sometimes desirable to maintain a slight negative pres-

sure on the tanks. This will prevent leakage to the atmosphere from a process which may be only partially enclosed.

A good deal can be done in the way of control by having urine analyses made at intervals. The ratio of organic to inorganic sulphates in the urine is an indication of benzol absorption. It is possible by means of periodic checks on the urine to see whether the other control measures are adequate.

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GAS MAINS

(Continued from page 84)

slow. In regular practice, if a cast-iron main has been badly damaged or torn up by any one of several causes, such as a cave-in or a contractor's steam shovel, the jagged ends of the pipe are cut off and lengths of additional pipe are installed to fill in the gap. This method is practical since only one such break is encountered at a time and the final result is a permanent repair.

A bombing raid, however, might conceivably produce dozens of such instances and length of time for restoration becomes the prime consideration. Working in collaboration with the Dresser Mfg. Co., makers of pipe couplings and special fittings, we finally developed what we believe to be the simplest method of restoring a main in the least possible time.

The essential design of this device is a long steel sleeve of sufficient diameter to slide back over the end of the broken cast-iron pipe, which is coupled thereto by means of a rubber gasket and follower ring. The fill-in pieces used to bridge the gap between two of these special fittings are lengths of ordinary steel pipe coupled together with standard mechanical couplings. Hence, any distance between the two broken ends of a cast iron main may be bridged without loss of time in cutting and fitting pipe.

CMP and the Chemical Industries

D. P. MORGAN *Director, Chemicals Division, War Production Board*

Chem. & Met. INTERPRETATION

After the first of next July, it will be virtually impossible to purchase any steel, copper or aluminum without first having been assigned an allotment number from one of the seven Claimant Agencies operating under the new Controlled Materials Plan. Chemical process industries, although not direct consumers of the controlled metals, will be affected because of needs for construction, maintenance and repairs. This article has been prepared to help Chem. & Met. readers to understand the plan and its workings. — Editors.

THE CONTROLLED MATERIALS PLAN is our first really comprehensive plan. In it we take a further step toward adding up in advance all supplies and requirements for certain key materials so that essential military and civilian programs can be adjusted to available resources and facilities. It is a fact that a great deal of totalling has been done right along but, heretofore, it was not done on the basis of programs balanced and approved in advance. It cannot be too strongly emphasized that raw materials accounts must be balanced on a cash basis. Where a shipment of steel is overdue production stops and this type of shortage cannot be balanced by deficit financing.

In its present form, the Controlled Materials Plan applies to only three raw materials, though it is set up in such a way that other materials may be brought under control at will. All three of the first materials to be brought under control are metals—steel, copper and aluminum. The control provided by the Controlled Materials Plan is primarily vertical, but horizontal control is also provided. The vertical control extends from the raw material at the mill level up through all stages of intermediate fabrication to the finished plane, tank, ship, etc. Horizontal control is introduced by forcing all the agencies which want these planes, tanks, ships, etc. to compute their requirements for steel, copper and aluminum in advance and submit budgets by months for the next 18 months. The sum total of all such budgets will then be compared with corresponding estimates of the total available supply. After these budgets have been adjusted to bring

aggregate supply and demand into balance, allotments of the controlled materials will be made to each agency.

In the evolution of this plan, it is understood that many schemes were submitted for consideration and that the best points of each were merged into a single program. Except for minor modifications, the resultant plan is believed to be roughly similar to the systems used in England, Germany and Russia. The controls applied by the British are said to be somewhat less formal and rigid. And it is possible that looser controls might be adequate for them because their problems are less complex and because, to some extent, deficits can be balanced by Lend-Lease. On the other hand, in the case of Germany or Russia, one would expect a more rigid and formal system as industry is practically a part of government in those countries. Presumably the industrial side of such a war program is operated like a single huge corporation.

By and large the main features of the Controlled Materials Plan are simple. As has been said before, it applies to the supply and requirements of steel, copper and aluminum. Accordingly, the Steel, Copper and Aluminum Divisions of the War Production Board are charged with the duty of estimating the available supplies of the materials under their supervision. Also, when the wheels start to turn, these so-called "Controlled Materials Divisions" will direct the production of the mills under their supervision into the proper channels, e. g., in the fabrication of steel, copper and aluminum. The suppliers of the three raw materials controlled by the plan are

represented, therefore, in the picture by their respective divisions in the War Production Board.

The consumers of these controlled materials are represented in the plan by the so-called "Claimant Agencies" of which there are seven, as follows: The War Department, the Navy Department, the Maritime Commission, the Aircraft Scheduling Unit (agent for the Army Air Forces and the Bureau of Aeronautics), the Office of Lend-Lease Administration, the Board of Economic Warfare, and the Office of Civilian Supply. These seven agencies represent everyone that is to get any steel, copper or aluminum.

These agencies get their allotments of metal by submitting budgets which will receive the approval of the Chairman of the Requirements Committee only after being adjusted to bring the aggregate sum of all budgets into balance with the estimated total supply of the corresponding controlled materials. The budgets submitted by the Claimant Agencies are based on data obtained from bills of materials. Except for products on the Class B list, to be discussed later, these bills of materials are used to determine the amount of each controlled material directly or indirectly required in the manufacture of a product needed by the Claimant Agency. This information is obtained from the so-called "Prime Consumers" or "Secondary Consumers." In other words, if a manufacturer wants to produce tanks for the Army, he must tell the Army how many tons of steel, copper, and aluminum he needs. Furthermore, he must say when the metal will be needed to bring about delivery of the tank on the desired schedule. Moreover, if the tank manufacturer buys a sub-assembly, which is not on the Class B list, he must obtain a bill of materials from his supplier which is combined with his own for his Claimant Agency.

Through these budgets, based on bills of materials, the plan provides a vertical integration which will trace the use for production purposes of controlled materials from the finished plane, tank or ship back to the mills producing the required steel, copper, and aluminum. The steps in

this process are illustrated in the accompanying diagram which shows the procedure followed—how requirements obtained through bills of materials are processed from the Secondary Consumers through the Prime Consumers to the Claimant Agencies where the total demand is determined for submission to the Controlled Materials Divisions and the Requirements Committee. It also shows the procedures followed in distributing the available supply down the line from the Requirements Committee.

In the foregoing discussion, the controlled materials were consumed as raw materials for production purposes. In actual practice chemical manufacturers, as distinguished from equipment manufacturers, consume almost no controlled materials for production purposes though large amounts of controlled materials, both raw and fabricated, are consumed in the construction of plants and for plant maintenance, repairs and operating supplies. These other uses are recognized in the plan which calls for separate bills of materials or estimates to be submitted by the Claimant for the maintenance of plants owned and operated by the Agency and for the plants under construction whose output will be used exclusively for the benefit of the Agency.

The Claimant Agency, therefore, must segregate the information submitted in its budget into three categories: (a) production materials, (b) construction materials and (c) maintenance, repair and operating supplies. Moreover, care must be taken not to include materials required for the manufacture of Class B items. In the latter group fall

nuts and bolts, rivets, washers, motors, generators, pumps, compressors, and a lot of other items which are so widely distributed that the tracing-through process would be too difficult to carry out. The procedure to be followed in the case of the Class B list will be described later.

Having totalled its requirements, the Agency is ready to submit its estimates to the Requirements Committee. In other words, through the use of bills of materials, the need for steel, copper and aluminum has been traced from the finished plane, tank, ship, etc. through all intermediate stages in fabrication to the mills in which the ultimate raw material must be produced. After this information has gone up the line to the Requirements Committee and after the necessary adjustments have been made there, the decisions of the Chairman of that Committee are handed down in the form of allotments. These are made to the Claimant Agencies and it is the duty of the Claimant Agency to divide the metal allotted among its offices and among their programs. A million tons of steel, allotted to the Army, for example, might be divided by that Agency so as to give Chemical Warfare Service 100,000 tons, the balance to tanks, ordnance, etc. It would then be the duty of the Chemical Warfare Service to divide its 100,000 tons among its previously estimated needs of raw and fabricated items for production, for construction, and for maintenance, repair and operating supplies. This sub-allocation by the Chemical Warfare Service is then conveyed to its prime contractors and by them to their sub-contractors and so on down the line until finally all the allot-

ments percolate through the many stages in the processing chain of industry to become eventually orders for metal to be placed with the producing mills.

The procedure to be followed with the Class B products is somewhat different. The Class B list has been broken into two parts: Group I and Group II.

There are significant differences in the way these two groups are handled. In the case of the Class B Group I items, the Claimant Agencies collect reports of requirements in terms of numbers of fabricated units (so many motors, compressors, pumps, etc.), but do not convert these estimates into pounds of component metals. In other words, bills of materials are not required. The conversion to pounds is made in the aggregate by the End Product Division, e. g., General Industrial Equipment for pumps. The requirements, for steel in this case, are then submitted through Civilian Supply to the proper Controlled Materials Division (Steel) and after adjustment to the Requirements Committee. If the budget is approved by the Requirements Committee an allotment of steel is made by the Chairman to the End Product Division (General Industrial Equipment, in this case) which sees to it that the pump manufacturers get their steel. This is done by allotments issued by the End Product Division to the manufacturers of pumps, in this case. At the same time a preference rating is assigned which will enable them to purchase Class B products and other materials.

As may be seen, there are not many items on the Class B Group I list which are used as production

CLASS B PRODUCTS LIST

The War Production Board booklet "General Instructions on Bills of Materials" contains lists of Class B products. Some of the items of possible interest to the chemical process industries are given below. The WPB booklet should be consulted for official information.

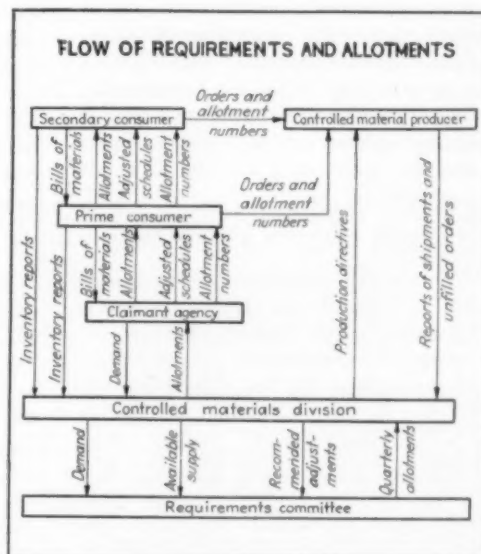
Class B — Group I

Batteries
Blowers and fans
Boilers
Burners, gas & oil
Compressors & vacuum pumps
Conveying equipment
Electric motor controls
Gas cylinders
Heat exchangers
Instruments
Motors & generators
Pressure vessels
Pumps
Speed reducers
Stokers
Switchgear
Transformers
Tubes, electronic
Turbo-blowers

Class B — Group II

Abrasive wheels
Asbestos end products

Bolts, nuts, nails, etc.
Bus supports
Carbon brushes
Ceramic mfg. machry.
Chemical producing machinery
Containers
Dust collecting equip.
Electrical conduit
Electroplating & anodizing equip.
Fibrous glass prods.
Fire extinguishing devices
Fittings, pipe
Hardware
Hose, metallic
Industrial explosives
Industrial safety equip.
Laboratory equip.
Maintenance & repair parts
Mining machinery
Mixers
Pulp & paper machinery
Refrigeration machinery
Scales & balances
Unit heaters
Valves
Welding equipment



materials by the chemical industry. In fact, from the viewpoint of the chemical industry, most of these items would be used for new construction or for maintenance, repair and operating supplies.

Under such circumstances, the question will be raised what provision has been made by the Controlled Materials Plan for estimating the metal required for Class B Group I items, for uses other than production. The answer, it may be said with some assurance is that the Class B Group I items, as well as Controlled Materials and Class A items* in our new construction projects, should be obtainable. However, it will be difficult to find all projected minor plant expansions not included therein (the dividing line between construction and maintenance and repair has been set at \$500.00). Also, maintenance and repair requirements are difficult to estimate for a wide list of products like those included in Class B Group I which comprises many different types of articles all the way from boilers and compressors down to $\frac{1}{4}$ -in. O.D. ball bearings.

The difficulty and importance of this problem of estimating maintenance and repair requirements cannot be overemphasized. And, lacking a better basis in the brief period of three weeks at our disposal, the Chemicals Division is planning a spot check in the field. To be sure, considerable data regarding metal consumption is available on the PD-25-A forms filed by Class I chemical companies that use in excess of \$5,000 of metals per quarter and which are therefore large enough to come under the Production Requirements Plan. Still, although this source may provide an overall check, especially regarding the consumption of Controlled Materials, it will not yield adequate information regarding Class A items or Class B Group I items. It is for this reason that the need for a field check seems unavoidable.

CLASS B GROUP II PROBLEMS

Controlled Material requirements for producing the items in Group II, which incidentally includes all "chemical producing machinery," are estimated in the aggregate for

the whole industry and not on the basis of individual requirements. These estimates are made by the End Product Division of the War Production Board having supervision over the production of the item in question in conjunction with the Office of Civilian Supply. For example, in the case of the chemical equipment industry, the combined budget for all producers will be worked out by Civilian Supply with the aid of the Chemicals Division, without reference to the Claimant Agencies. Incidentally, it is understood that the policy will be to keep Class B Group II industries operating at a high level subject to limitation orders.

The mechanism by which the acceptance of orders corresponding to allotments is assured is the allotment number. This is, in effect, a warrant for the delivery of a given amount of material on a specified preference rating in a particular month.

As has been noted before, the allotment number is accompanied by a preference rating. This rating is important in determining the scheduling of orders for the delivery of controlled materials and Classes A and B products. It is significant also, that the distribution of all scarce materials and products not covered by the Controlled Materials Plan is to be effected by the existing preference rating system.

Since this is not an order on a stipulated concern, it may be necessary for the prime or secondary contractor to shop around to fill his orders. And, to this extent, the allotment number is analogous to a fishing license. Yet, according to the Plan, the stream is protected and the fish are there in the right quantities for each licensee, though the late comer may find it difficult to locate pools that have not been fished out. The appropriate Controlled Materials Division will assist companies with allotments to place orders when such assistance is necessary.

SUMMARY

That is the essence of the Controlled Materials Plan. The Navy, for example, finds how much steel it will need by summing up all the data on all the bills of materials obtained from its prime contractors. The latter, in turn, get their information from other secondary contractors and so on, down the line to the mill. The Requirements Committee adds the Navy's request to

those of the Army and of other agencies obtaining a total which, no doubt, will exceed the total supply. Adjustments are made and finally an allotment of steel is issued to the Navy which divides its quota among its offices and they, in turn, issue allotment numbers to their contractors who extend them to sub-contractors and so on eventually to the producing mills.

Clearly, the Controlled Materials Plan has a positiveness that is most welcome. It will force the War Production Board to face frightening issues regarding the use of steel for planes, tanks, and ships as compared with the maintenance of mills making soft drinks and ladies' underwear.

Again, this is the first plan to provide for rigid vertical integration plus the vitally essential feature of totaling all budgets horizontally across the board in advance of allotment. Still, the amount of detailed work to be done is immense and there is a very real administrative problem involved in meeting the rather close time schedule which has been laid down. To illustrate the plan is to become effective in the second quarter and to be mandatory in the third quarter of 1943. This means that initial deliveries should be made early in April. And, since the processing period for some fabricated articles is at least 45 days, it will be necessary to place orders at the mills about the middle of February. Considering that the Chairman of the Requirements Committee is scheduled to make his allotment on February 1, it is clear that the process of passing along allotment numbers must be carried to completion in such instances with great rapidity.

The Controlled Materials Plan undoubtedly will be found to have many minor defects and probably some major ones. Yet, it provides for positive planning of the war program and it is difficult to see how certain much-needed decisions regarding the essentiality of various civilian activities can be evaded. The administration of the Plan will be a problem and its timing schedule is exceedingly close. Still, the Plan has the great advantage of providing for operation on a cash basis and for settling issues regarding supplies and requirements in advance before the account is overdrawn. Despite the difficulties involved, the urgent need for balancing the books is a very strong argument for the Controlled Materials Plan.

* Controlled Material: carbon steel, alloy steel, copper, aluminum and such other materials as may be prescribed from time to time. Class A Product: any product containing any controlled material fabricated beyond the forms and shapes specified in the CMP Materials List except a Class B product.

Manning Tables for Manpower Inventory

Chem. & Met. INTERPRETATION

To assist essential industry in the concurrent process of manpower withdrawals and replacements, and in taking manpower inventories, the government has prepared the so-called Manning Table Plan. Worked out by the War Manpower Commission in cooperation with the Selective Service System, the plan represents, in the opinion of the sponsoring officials, the first forward step toward a systematic solution of essential industry's manpower problem in any war situation. Herein the editors of *Chem. & Met.* have abstracted outstanding features of the plan from a report published in the November issue of *Factory Management and Maintenance*.—Editors.

AVAILABILITY of labor has hitherto been one of the less considerable factors in a manufacturer's plans. Henceforth it will be paramount. The long-predicted general shortage of manpower is visibly at hand. This is shown by such signs as the "certificate of release" procedure introduced to enforce an "employment stabilization" order to save the sagging curve of production in copper mines, anti-pirating agreements prevailing in certain industrial centers, women invading industry in a way that only a shortage of men could make possible.

One need not be an alarmist to recognize in these facts a need for planning. The United States government is now urgently asking industry to think of the nation's manpower supply in terms that are entirely new. However, the tension already evident in the labor market provides certain clues to the manpower problem that lies ahead.

Meanwhile, men in government positions who are making manpower policy must contend with a host of imponderables and variables, many of which lie wholly beyond the possibility of anything close to accurate prediction.

Out of all this confusion, only these things are reasonably clear today: (1) Practically all men of military age and fitness must enter the armed forces of our country; (2) replacements for essential industry must be drawn from the reserve labor forces; (3) to achieve the minimum indicated expansion, intensive regulation will be needed. To increase,

or even to maintain it, total regulation will be required.

Because time is short, industry must both plan and act at once. It must take a continuing inventory of essential manpower needs simultaneously as it withdraws and replaces workers.

PURPOSE OF MANNING TABLES

The Manning Table Plan is a system to provide for the listing of the personnel requirements of essential war industries according to job classification. *This means a listing of jobs, not men.* Its immediate objectives are (1) to facilitate the orderly withdrawal of replaceable workers from essential industries into the armed services in the *inverse order* of their essentiality, and (2) to provide for their replacement by workers taken from reserve labor sources with the least possible disturbance.

Further objectives of the plan are to provide the basis of a complete inventory of essential manpower needs; to reveal to employers the

necessity and the opportunity for training and upgrading of workers; to call to their attention ways in which women, older workers, and handicapped workers can be utilized; and to provide the necessary data for a reasonably accurate forecast of future labor requirements.

The plan will provide the justification for deferment of men in essential positions when such action is in accordance with Selective Service regulations. A manning table is prepared by an employer and is then officially validated. After that it serves as a guide to local Selective Service Boards in determining deferments. The plan has been endorsed by the Management-Labor Policy Committee of the War Manpower Commission.

Manufacturing plants whose business volume is 75 percent or more in war work, and certain essential industries such as utilities and railroads, will participate in the plan. National and regional industrial groups and trade associations will assist in passing upon applications and determining some job classifications.

PROCEDURE FOR FILING

A prospective applicant obtains, fills out and returns the manning table application issued by the regional or area director of the War Manpower Commission nearest him. If the application is approved, the applicant will receive five copies of the manning table with instructions for compiling it. A manning table is filled out for *one plant*, not a department and not a company having several plants.

The applicant retains one copy and forwards the other four to the regional or area W.M.C. director who arranges for validation, retains one copy, sends one to the state director of Selective Service, one to the area director of the United States Employment Service, and one to Washington. Selective Service pro-

| MANNING TABLE Schedule A | | | | | | | | | |
|----------------------------------|-----------------------------|-------------------------------------|------------------------------|-------------------------|----|-------|---|-------|----|
| OCCUPATIONAL IDENTIFICATION DATA | | Dict. & Plant Code | Minimum Training Time (hrs.) | Present Number Employed | | | | | |
| Line Number | Plant Job Title | | | White | | Other | | Total | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | PRODUCTION LATHE DEPARTMENT | | | | | | | | |
| 1 | FOREMAN | FOREMAN-II | 5-72.746 | 5000 | 2 | 0 | 0 | 0 | 3 |
| 2 | LATHE HAND (1ST CLASS) | ENGINE LATHE OPERATOR - I | 4-71.011 | 2400 | 15 | S | 0 | 0 | 22 |
| 3 | LATHE HAND (2ND CLASS) | ENGINE LATHE OPERATOR - II | 6-72.011 | 600 | 4 | S | 0 | 0 | 66 |
| 4 | DRILL PRESS OPERATOR | SENSITIVE-FEED DRILL PRESS OPERATOR | 6-72.033 | 400 | 6 | 0 | 0 | 0 | 3 |

| MANNING TABLE Schedule B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------------|-------------|---|---|-------------------------------|--------------|-------------------------------|---------------------|-------------------|--------|------|--------------------|-----------------------|----------|--------------------|----------|------------------------------|------------------|--------------------------|---------------------|---------------------|-------------------|--------|------|--------------------|-----------------------|----------|--------------------|----------|-------------|------------------|--------------|---------------------|---------------------|-------------------|--------|------|--------------------|-----------------------|----------|--------------------|
| Sheet 1 of 6 Sheets | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Was Manpower Commission WMC Form No. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Line Number | Percentage | | Job Filled by Handicapped Workers | Job to Be Re-assigned (Job Breakdown) | Supplied From Within Plant | | ADDITIONAL FUTURE LABOR NEEDS | | | | | | | | | | RECRUITED FROM OUTSIDE PLANT | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | Monthly Requirements | | | | | | | | | | Max. Needs | | Min. Experience Required | | | | | | | | | | | | | | | | | | | | | | |
| | By Dept. | By Plant | | | Current Month | 2nd Month | 3rd & 4th Months | 5th & 6th Months | Total 6 Months | Number | Date | Same Experience | Related Experience | Trainees | Inex- perienced | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | Upgraded | Transferred | Current Month | 2nd Month | 3rd & 4th Months | 5th & 6th Months | Total 6 Months | Number | Date | Same Experience | Related Experience | Trainees | Inex- perienced | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Upgraded | Transferred | Current Month | 2nd Month | 3rd & 4th Months | 5th & 6th Months | Total 6 Months | Number | Date | Same Experience | Related Experience | Trainees | Inex- perienced |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRODUCTION LATHE DEPARTMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 31 | 1.3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 7-43 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 229 | 9.2 | 0 | X | 8 | 0 | 0 | 5 | 3 | 0 | 8 | 8-7-43 | 1 | 7 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 658 | 27.5 | 0 | 0 | 7 | 0 | 3 | 15 | 10 | 0 | 28 | 49 | 7-43 | 0 | 0 | 28 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 21 | 1.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7-43 | 0 | 1 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | |

cedure, after validation, will be discussed later.

In general, the code references of the *Dictionary of Occupational Titles* (Superintendent of Documents, Washington, D. C., price \$2.00) will be used but employers may file their own job descriptions.

Manning tables will be kept current by periodic review of not less than each six-month period and by special review whenever the personnel requirements of a plant are substantially changed.

MANNING AND SELECTIVE SERVICE

The manning table must be accepted by the state director of Selective Service of the state in which the plant is located before it is applicable to any Selective Service activity. When the state director has accepted the plan, he will assign his state acceptance number to the employer, who will then be authorized to use this number and to place the prescribed state acceptance stamp on the affidavit (Form 42A), indicating that the time for replacement of an employee is in accordance with the table.

When an employer has been notified that his table has been accepted, he is authorized to use his state acceptance stamp on the affidavits (Form 42A) which were filled in accordance therewith. The employer will file Form 42A for all employees within the ages liable to military

service for whom occupational deferment is then necessary. Form 42A filed under the Manning Table Plan and bearing the authorized state stamp will be forwarded by the employer direct to the local board and will supersede any previous request for occupational deferment.

The new Form 42A will show how long it will take to replace the employee, the time indicated being taken from the accepted manning table.

Until further notice, it will not be necessary to file a Form 42A for registrants who have wives and children, or for registrants who have children with whom they maintain a bona fide family relationship.

The employer should, however, file an Occupational Certification by Employer (Form 42B) for such employees. Whenever the director of Selective Service determines that it is necessary to reclassify men in this status, the employer may file a Form 42A. This will enable the local boards properly to classify the registrant and to notify the employer if the registrant is classified or reclassified.

When an employer has filed Form 42A or 42B for a registrant, the local board will be required to notify the employer on Notice to Employer (Form 59 revised) whenever the registrant is classified or reclassified.

When an employer has filed an affidavit (Form 42A) for a registrant, this form shall be considered

to be written evidence of the occupational necessity of the registrant. The employer may appeal to a Board of Appeal from any classification of the registrant by the local board under the provisions of Section 627.2, Selective Service regulations.

Full responsibility for classification as prescribed in Selective Service regulations remains with the local board, and all classifications are subject to the usual appeal procedure.

Acceptance by the state director and use of the approved state stamp informs the local board that careful consideration has been given to occupational classification requirements and the time required to replace registrants by the employer, the War Manpower Commission, and by the state director of Selective Service. Local boards will, however, continue to give the same serious consideration to requests for deferment from plants which do not use the Manning Table Plan as they have in the past.

Legislation making men 18 and 19 years old available for military service will probably cause slight changes in some of the forms illustrated on these pages.

The manning table consists primarily of schedules A, B and C, sections of which are reproduced on these pages. The numbers entered in the "line number" column of schedule B should correspond to those entered in schedule A. The same holds for schedule C. The proper procedure for filling out the forms is made self-evident by the forms themselves.

ESSENTIAL DATA

Other forms than those reproduced on these pages can be used. However, the basic information which any job description must contain regardless of the form chosen is as follows: (1) Name of company; (2) line number, page and department in the manning table to which each job description refers; (3) plant job title or titles if job is known by more than one title; (4) minimum time required to train a qualified inexperienced person to reach normal production; (5) unusual physical requirements; (6) type of supervision given or received; (7) a description of exactly what is done on the job under consideration, including the purpose of the job and listing the machines, tools, special skill, knowledge, and judgment used or required; (8) percentage of total time spent in performing each of the major tasks which comprise the job.

| MANNING TABLE Schedule C SELECTIVE SERVICE DATA | | | | | | | | | | | | | | | | | Sheet 1 of 6 Sheets | | | |
|---|----|----------|---------|----------------------|---------------|---------|----------------------|---------------|---------|----------------------|---------------|---------|----------------------|---------------|---------|----------------------|---------------------|---------|----------------------|-------------|
| Line Number | | Under 20 | | | 20 Through 26 | | | 27 Through 32 | | | 33 Through 38 | | | 39 Through 44 | | | 45 and Over | | | Total Males |
| | | Single | Married | Married & Dependents | Single | Married | Married & Dependents | Single | Married | Married & Dependents | Single | Married | Married & Dependents | Single | Married | Married & Dependents | Single | Married | Married & Dependents | |
| | | | | | | | | | | | | | | | | | | | | |
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | | |
| PRODUCTION LATHE DEPARTMENT | | | | | | | | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | 2 | | | 1 | 3 | | |
| 2 | | | 1 | | | 1 | 3 | 3 | | 2 | 4 | | 2 | 5 | | 1 | | 22 | | |
| 3 | 3 | | 6 | 5 | 1 | 4 | 6 | 8 | 2 | 6 | 12 | | 3 | 10 | | | | 66 | | |
| 4 | | | 1 | | | | | | | | | | | | | | | 1 | | |

Special Kettle Setting Simplifies Temperature-Cycle Control

WILLIAM J. SHORE *Industrial and Heating Engineer, New York, N. Y.*

Chem. & Met. INTERPRETATION

An oil processor for the varnish industry had the problem of heating a 500-gal. batch of a special oil to a high temperature, according to a stepped heat-and-hold schedule. The problem was solved in a simple and effective manner by direct firing with either gas or oil, using a heavy refractory setting for the kettle. The heat storage of the setting, coupled with adequate insulation, made it possible to hold practically uniform temperature at each level. Cooling was accomplished by spraying the kettle bottom with water to reduce the oil temperature by 3 to 4 deg. per minute.—*Editors.*

AN INSTRUCTIVE example of the use of a heavy refractory furnace setting as a means for achieving close temperature control in a process vessel, through release of the heat stored in the setting, recently occurred in a direct-fired kettle installed for processing a varnish oil. The kettle was of 1,000 gal. capacity, for treating a 500-gal. batch of a special oil of high viscosity. To withstand corrosion and to avert darkening the color of the oil, the kettle was of stainless steel, 5 ft. 6 in. in diameter by 6 ft. high. It was designed for operation under a reasonably high vacuum to permit the removal of fumes and the recovery of valuable byproducts by means of a condenser, and it was equipped with efficient agitating apparatus for rapid and thorough heat distribution throughout the kettle contents.

The manufacturer's problem was to heat this viscous oil according to a definite temperature schedule, raising the temperature in several definite intervals to predetermined temperature levels, at each of which the temperature was held for a period. After holding at the highest temperature for the required time, it was necessary to lower the oil temperature rapidly. Although the actual figures cannot be given, for sake of illustration it can be assumed that the batch was to be heated from room temperature to 350 deg. F. at the rate of about 9 deg. per min., and this temperature was to be maintained for one hour. The tempera-

ture was then to be increased from 350 to 425 deg. F. and held for one hour; increased from 425 to 475 deg. and held for one hour; increased from 475 to 550 deg. and held for one hour. After this heating cycle, the batch was to be cooled at the rate of 3 to 4 deg. F. per minute. In each stage the volatiles were to be recovered or discarded, depending on conditions.

The author was called in to determine the best method of achieving this heating and cooling schedule and after considerable study decided on a direct-fired installation, arranged for burning either oil or gas with forced draft, and with the setting so designed that flame impingement on the kettle would be avoided, since this would be harmful. A novel method of cooling was used, with water sprays playing directly on the kettle bottom to effect the rapid cooling necessary. The kettle has now been in operation for over a year and despite this apparently drastic treatment, no evident disintegration of the setting has as yet taken place.

Assuming an overall efficiency from fuel to heat in the product of 40 percent, it was evident that a fuel consumption of 20 gal. of oil per hour would meet the requirements. However, in order to obtain this high heat release, it was essential to design the combustion chamber carefully and, since flame impingement on the kettle bottom must be avoided, to design the chamber so that the

kettle would be heated only by the products of combustion and by the radiant heat from the brick setting. Also, since only the kettle bottom and a small portion of the side would be exposed, an intensely hot flame in a highly radiant fire box was called for, thus requiring the use of forced draft on the burner to supply all the air needed for combustion. A burner of this type may be used either for oil or gas and may be completely sealed, thus doing away with open flame hazards.

The design chosen for the setting is shown in the accompanying drawing. The flame is directed into a straight tunnel about 6 ft. in length, at the end of which it enters the circular combustion chamber in a tangential direction. The flame whirls about the circular passage, heating the side walls to a white heat and thus achieving complete combustion. After a flame travel of about 18 ft., the hot products of combustion, continuing in their circular path, pass around the sides of the kettle and leave the chamber in a tangential direction through a short section of sheet steel breeching to an adjoining stack. The breeching has an access door to permit entrance into the combustion chamber for any necessary repairs.

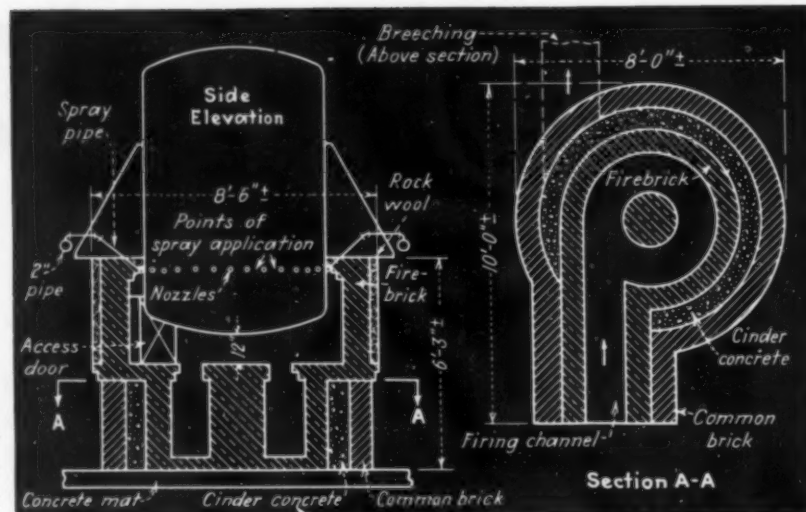
In planning this installation, low initial investment cost, reliable operation and the simplest possible type of control were necessary. The author is by no means against automatic temperature control or use of light-weight modern types of refractories, but in this particular instance heat-storage refractories were desirable and their use made it possible to dispense with all control equipment except a recording thermometer and the necessary manual burner and cooling water controls.

The required temperature schedule specified that the temperature be held at each of the several levels for a period of one hour, with a variation no more than plus or minus 5 deg. F. This could be accomplished with a heavy firebrick setting and an efficient job of insulation. Firebrick is capable of absorbing and

storing large quantities of heat, but having a low coefficient of heat transmission, it gives this heat up slowly, after the burner has been shut off, and over a long period of time. When the flame is extinguished, for a short time the high-temperature refractories give up their heat at a rapid rate to the kettle contents, raising the oil temperature about 5 deg. F. and reducing the refractory temperature to a level only slightly higher than that of the oil. From that point on, steady radiation of heat to the kettle largely supplies what heat loss there is, the oil showing a temperature drop of only about 8 deg. in each holding period of one hour. Rock-wool blanket-type insulation 3 in. thick on both the kettle and the firebrick setting meets the requirement.

Since it is possible to predict quite closely how much heat will be given up by the setting after the burner is extinguished, and how much heat will be lost from the kettle contents thereafter, an extremely simple method of temperature control is available. For the type of work required, sufficient accuracy is attained, free of all complications of control equipment and wiring. The method eliminates the necessity for flame-failure protective equipment and is foolproof in every respect. No experienced attendant is necessary since, once the plant technician has adjusted the burner air and fuel controls, and the cooling water rate, it is only necessary for the operator to start the burner, shut it off as it approaches the desired temperature and start it again an hour later for each phase in the heat treatment.

When the plant was originally started, the technician ran a sample batch, preparing a temperature chart which indicated at what time to light the burner and when to shut it off. With this schedule the operator has little to do except to note the temperatures on the thermometer chart. As they reach points shown on the sample chart which is before him, he turns the burner on or off accordingly, and for the final operation opens a quick-opening water valve controlling the cooling water supply. The cooling water rate has previously been adjusted with a globe valve in the line, so even this operation requires no judgment on his part. Further adjustments are not necessary since these were initially set to give the correct air and gas or air and oil mixtures and the correct fuel flow for the desired rate of temperature rise.



Elevation and cross section of direct-fired kettle setting

In putting the burner into operation, the operator merely opens the fuel valve wide after the blower has been started and applies the gas lighter. From that time on until the desired temperature has been reached he need pay no attention to the flame.

Occasionally during each run the operator takes samples which are tested to make certain that variations in his raw material, which is a natural product, do not require slight changes in the time-temperature schedule.

Since rapid cooling is essential after the batch has been held at 550 deg. F. for an hour, an efficient method of cooling was necessary. While there are many possible ways, the standard methods were difficult of application in this instance. Originally it had been intended to cool the oil by adding an equal amount of the cold finished product, but the viscosity was so high that the idea was abandoned. With the necessary cooling rate 3 to 4 deg. per minute, it was evident that air cooling would be insufficient as it was found that the maximum drop would be 1 deg. in 6 minutes. The writer proposed spraying cooling water directly on the kettle sides from inside the set-

ting, using a row of 24 stainless steel nozzles equally spaced about the kettle circumference, all nozzles spraying simultaneously.

The question of possible adverse effects on the kettle was put up to the kettle manufacturer who concluded that a uniform cooling rate of 4 deg. per minute should not affect the kettle any more than a 4-deg. rise. The effect on the setting was also questioned. At first impact, of course, the water is turned into steam upon hitting the kettle, but experience has shown that much of the water flows down the side of the kettle and drops on to the firebrick. Actually, nothing much happens except that the water runs out at the bottom of the setting. Doubtless, eventual failure of the bricks will occur somewhat more rapidly than with less drastic cooling, but the setting is so built with standard shapes, which are laid in such a manner, that they are easily replaceable, either from the inside or the outside.

In any event, that part of the combustion chamber which is difficult of access is not subjected to water. Firebrick is not expensive and, as has already been noted, one year's operation has shown no harmful effects.

The drawing shows how the water is applied. The 2-in. header around the outside of the setting is provided with individual $\frac{1}{8}$ -in. branches running to the 24 stainless steel spray nozzles. Each nozzle has a $\frac{1}{8}$ -in. opening. By this arrangement all nozzles receive their water at full pressure. Since the entire equipment is in an unheated shed, a valve is provided to empty the header of all water.

Installed Cost of Heating and Cooling System for 1,000-gal. Autoclave

| | |
|--|---------|
| Concrete foundation..... | \$100 |
| Supporting steel columns..... | 45 |
| Operating platform, ladder..... | 125 |
| Rigging kettle into place..... | 75 |
| Gas and oil burner..... | 60 |
| Motor-driven blower..... | 300 |
| Electric wiring, air and oil piping..... | 150 |
| Firebrick combustion chamber..... | 750 |
| Insulation installation..... | 100 |
| Exhaust breeching..... | 75 |
| Recording thermometer..... | 175 |
| Water cooling system..... | 400 |
| Total | \$2,355 |

In operation, the operator of the equipment stands near the temperature recorder, at which point he can reach the quick opening valve for turning the water on and off. The temperature drop is 4 deg. per minute from 550 to 350 deg. F., and from there down, the drop is at the rate of 3 deg. per minute. It requires about 18 lb. of water per minute at 60 deg. F. to produce this temperature lowering.

A year's experience with this equipment has shown that it can treat a 500-gal. batch in an 8-hour shift with direct costs including: direct labor, \$6; fuel oil at 4c. per gal., \$2.50; and electricity for stirring, the blower, and vacuum, \$2.20.

The installation described is an interesting case where the use of extra-heavy refractories and effective insulation made possible the elimination of much equipment or-

dinarily considered necessary, thus giving low initial and operating cost, without adverse effect on the operating characteristics. The accompanying tabulation of setting, burner and cooling equipment and installation costs gives an idea of the economical nature of the installation. The table includes no figures for the kettle itself, nor for its piping or condenser, referring only to the heating and cooling equipment. Furthermore, oil storage and pumping equipment were already available and the cost of burner piping included only the actual piping from the existing system.

In conclusion, the author acknowledges the assistance and cooperation of the Anthony Burner Co., who supplied the gas and oil firing equipment; and of the Blaw-Knox Co., manufacturers of the kettle installed as part of this installation.

opening or closing dome covers or completing dome connections, wrenches should be pushed (not pulled) to minimize possibility of the workman slipping. Naked flames and smoking must be prohibited.

Before the car is connected with or contacted to the unloading line or unloading equipment, the tank car must be grounded effectively. Fig. 1 shows a suggested method of doing this. Approved explosion-proof electrical equipment should be used around the unloading dock and in the vapor area. The area should be provided with approved fire extinguishers, safety fire blankets and a suitable type of "No Smoking" signs.

In some cars the discharge pipe extends into a fitting on top of the dome for top unloading. Cars with both a discharge pipe and a vacuum relief valve do not require removal of the manhole cover before unloading when top unloading by pump or syphon is contemplated. If cars are not so equipped, however, definite methods must be used in removing the manhole cover. The screw type must be loosened with a bar of non-sparking metal. Two complete turns expose the vent openings. If the sound of escaping vapor is heard, the cover must be screwed down and the pressure vented as later described. During unloading the cover must be in place, but not entirely screwed down, to permit air to enter. With the hinged and bolted type, all nuts must be unscrewed one complete turn and the same precautions regarding pressure used as above. With the interior type, dirt and cinders must be removed before the yoke is unscrewed and during unloading the yoke screw must be tightened to bring the cover within $\frac{1}{2}$ in. of closed. With the protective housing type, one housing cover pin is removed to lift the cover, exposing valves and fittings. When unloading through the dome or through the bottom outlet of cars equipped with interior manhole covers, the manhole must be protected against entrance of sparks by an asbestos or metal cover or by covering with wet burlap or fire retardant cloth.

UNLOADING

Where bottom unloading is prohibited, tank cars equipped only for bottom unloading must be unloaded by means of a special top-unloading device consisting of a special cover which is placed over the opened manhole and through which a pipe is inserted. (The Manufacturing Chem-

Unloading Tank Cars Containing Flammable Liquids

EDITORIAL STAFF SUMMARY

Chem. & Met. INTERPRETATION

The following discussion of safe means for unloading steel tank cars filled with flammable liquids is a brief abstract of the 9-page bulletin on this subject recently published by the Manufacturing Chemists' Association. For full details the reader should refer to the complete bulletin, described as Manual Sheet TC-4, which may be obtained at a price of 12 cents per copy by addressing the Manufacturing Chemists' Association, 608 Woodward Building, Washington, D. C.—Editors.

AT LEAST six states prohibit unloading flammable liquids from tank cars through bottom outlets while some states prohibit syphoning. Others require official approval of unloading sites and exert supervision over storage tanks and unloading equipment. All requirements pertinent to the locality of the receiving plant should be familiar to the consignee.

[Applicable paragraphs on tank car shipments of flammable liquids, from the regulations of the Interstate Commerce Commission, appear in the complete text of Manual Sheet TC-4, identified by ICC section numbers.]

The unloading track should be level and the car should be accurately spotted. Brakes must be set,

the wheels blocked and appropriate caution signs must be displayed until the car is unloaded and disconnected from the unloading line. Use of derails at the open end or ends of the siding is recommended.

Unloading should be carried out by a properly instructed responsible person who should not unload by artificial light unless approved closed electric lights are available. Cars should not stand connected after unloading nor be unattended while connected. The permanent storage tank must be properly vented and care taken to ascertain the car contents and to avoid mixing of products. Non-sparking tools must be used and car fittings must not be struck with hard objects. Tools must be kept clean, and in

ists' Association will provide details on this device.) In all cases, top unloading is recommended rather than bottom outlet unloading. Air pressure must not be used, but pumping is recommended. Use of water displacement or inert gas pressure should be made only on instructions from the shipper. To relieve pressure in a tank car before unloading, the tank can be cooled with water or it can be vented by raising the safety valve or opening the vent on the dome at short intervals, providing a dangerous accumulation of flammable vapor outside the car will not result.

To unload through the top, in case of a car not equipped with an eduction pipe, it is necessary to open or remove the manhole cover and insert a 2-in. pipe of non-sparking metal to within about 1 in. of the bottom. The closure is removed from the valve through which the car is to be unloaded, the eduction pipe unloading valve is connected to

the pump suction line, and the valve opened. If the car does not have a vacuum relief valve on the dome the manhole cover is opened as previously explained. Then the pump is started.

When the car is to be unloaded through the dome with a syphon (the top of the storage tank must be below the bottom of the tank car), the procedure is as just described except that the eduction pipe unloading valve is connected to the syphon unloading system as shown in Fig. 2. The syphon tank is filled with a liquid similar to that in the car, the valve on the car opened and the valve on the syphon tank opened to start the syphon.

To unload a car through the bottom (not recommended), extreme care is necessary since if the car should be struck and the bottom connection torn loose, probably the entire contents would be lost with hazard to life and property. The manhole is opened and the car vented

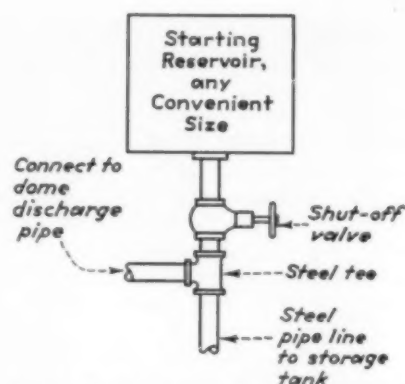


Fig. 2—Simple device for starting unloading syphon

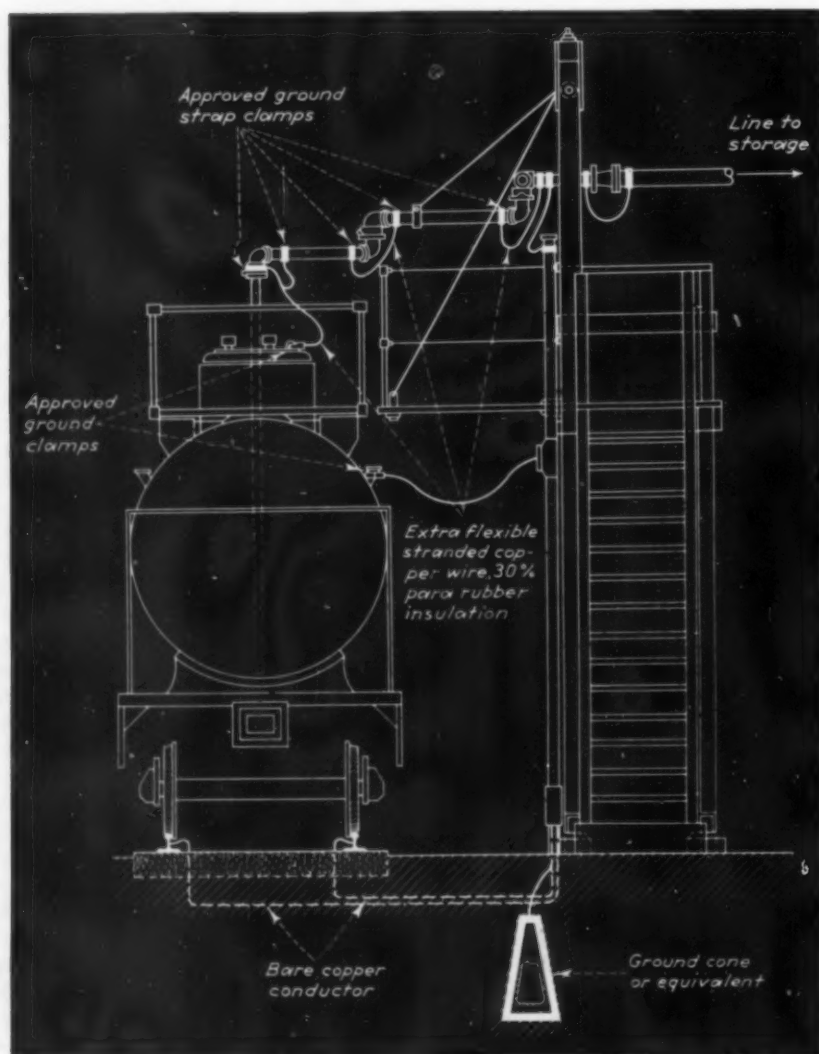
as described above. Then the outlet leg valve cap is loosened after a pail has been set to catch any liquid in the outer chamber and to check for continuous leakage. If the leakage cannot be overcome by operating the outlet valve handle several times to seat the valve, then unloading must be accomplished through the dome.

The unloading line should be of standard full-weight wrought iron or steel pipe with standard fittings, although short sections of flexible metal or equivalent hose may be used for flexibility where rigid connections are impracticable. Piping should be secured to prevent vibration, and allowance should be made for expansion and contraction. Approved shut-off valves should be installed in the suction and discharge lines at the pump, convenient to the storage tank. If the latter is above the pump, an approved check valve must be used.

Pumps should be located in a separate fireproof building at a safe distance from the storage tank and other buildings and should have all electrical equipment of explosion proof construction. Approved type pumps should be used, preferably of the centrifugal type. The pump should be equipped with a relief bypass if of the positive type.

Great care must be used in examining empty cars. They should not be entered before they have been thoroughly cleaned by steaming or other approved methods, nor should lights other than an approved flashlight be used for examination. If persons must enter the car after proper cleaning, they must be provided with a hose mask and safety belt with rope attached, and another person should be stationed at the manhole. Since metal is liable to create sparks, men entering the tanks should not be allowed to use metal tools and should be equipped with a proper type of safety shoes.

Fig. 1—Suggested method of grounding tank car before unloading



Manufacture of Butadiene From Ethyl Alcohol—I

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T. INOUE, *Consulting Chemist, Chicago, Ill.*

Chem. & Met. INTERPRETATION

Comparatively little technical information has been published on processes for manufacturing butadiene from ethyl alcohol. Yet this subject is of vital importance today and need for detailed information is acute. The authors have covered and digested thoroughly the literature on the subject and present herein the first of two installments outlining to chemical engineers the technology of the various processes for producing butadiene from alcohol.—Editors.

SUCCESSFUL production of marketable synthetic rubber from ethyl alcohol depends upon an abundant supply of inexpensive alcohol from which to produce 1,3-butadiene, the basic constituent of Buna rubbers. Accordingly, rubber manufacture from ethyl alcohol has received particular attention in Russia with its large resources of fermentable grains, and also in Poland, prior to the present military occupation, where the alcohol was produced principally from potatoes.

Starting from ethyl alcohol as the raw material, the manufacture of butadiene rubber is divided into three phases: (1) synthesis and purification of the butadiene, (2) polymerization of the butadiene, and (3) compounding of the butadiene polymer.

There are a number of ways by which butadiene can be produced from ethyl alcohol, depending upon the type and sequence of the reactions used and upon the intermediate compounds involved. A bird's eye view of the inter-relations that exist between the different methods that can be used and of the pathways that lead from ethyl alcohol to butadiene is given diagrammatically in Fig. 1. In the present discussion, the methods for producing butadiene from ethyl alcohol are divided into six groups:

1. Direct conversion of ethyl alcohol.
2. The aldol method.
3. Ethylene methods.
4. Acetylene methods.

5. Acetaldehyde condensations and conversion to butadiene.
6. Crotonaldehyde methods.

DIRECT CONVERSION

The direct process for the conversion of ethyl alcohol to butadiene consists of the simultaneous dehydration and dehydrogenation of ethyl alcohol as developed in Russia by Lebedev.^{1,2} This process is the result of the simplification of the Ostromyslenski method for the condensation of acetaldehyde with ethyl alcohol³, and of the development of a pyrolytic process established by Ipatieff in 1903⁴.

Synthesis and purification are carried out according to the flow diagram given in Fig. 2, which is based on a catalyzing chamber or conversion tube approximately a foot in diameter and 12 feet in length. The catalyzing chamber is constructed of steel and lined on the inside with a glass enamel. It is set within a heating chamber, the heat for which is supplied by a furnace fired with the gaseous by-products of the process. Several conversion tubes of small diameter are preferable to one of large diameter, in that heating of the catalyst is facilitated by using a long narrow tube. Previous to the conversion, the vapors of ethyl alcohol and water, as well as the air that is used to dilute the alcohol, are superheated to 450 deg. C. in the superheater, so that the temperature of the gaseous mixture when it enters the conversion chamber is about

equal to that of the catalyst itself.

Alcohol vapors are injected through a nozzle at the top of the conversion chamber, which is usually set in a vertical position and which is maintained at a temperature of 400-425 deg. C. The vapors, as they traverse the length of the tube, are converted by a catalyst mixture of alumina and zinc oxide to butadiene and other products. These gaseous and volatilized reaction compounds are drawn from the conversion chamber and passed through a cooler which is maintained at 0 deg. C., to condense the unconverted alcohol and other products condensable at this temperature. This condensation creates enough vacuum to draw the alcohol vapors through the converter at pressures slightly below atmospheric pressure, namely, at about 680-710 mm. mercury.

The cooling operation condenses and separates the gaseous products from the liquids. In Table I are given the compositions of the gaseous and liquid fraction as determined by Akobzhanov⁵. The liquid fraction consists for the most part of unconverted ethyl alcohol with

Table I—Products of Direct Catalytic Dehydration and Dehydrogenation of Ethyl Alcohol

| Products | Percent Yields |
|---|----------------|
| Gases: | |
| Hydrogen..... | 1.3 - 1.6 |
| Carbon monoxide..... | 0.2 - 0.5 |
| Methane and homologs..... | 0.4 - 0.6 |
| Ethylene..... | 5 - 8 |
| Butylene (pseudo-butylene or butene-2)..... | 3 - 4 |
| Butadiene..... | 20 - 25 |
| Pentene-2..... | 0.5 - 0.7 |
| Hexene..... | 0.4 - 0.5 |
| 2, 4-Hexadiene..... | 0.6 - 0.8 |
| Liquids: | |
| Piperylene..... | 0.5 - 0.7 |
| Toluene..... | 0.1 - 0.2 |
| p-Xylene..... | 0.5 - 0.7 |
| Bivinyl dimer..... | 0.05 approx. |
| Ethyl ether..... | 2.0 - 5 |
| Ethyl butyl ether..... | 0.5 - 1 |
| n-Butyl alcohol..... | 2 - 4 |
| Crotyl alcohol..... | 0.5 - 1 |
| n-Hexyl alcohol..... | 0.5 - 0.8 |
| n-Amyl alcohol..... | 0.1 approx. |
| n-Unsaturated hexyl alcohol..... | 0.05 - 0.1 |
| n-Octyl alcohol..... | 0.3 approx. |
| Acetaldehyde..... | 2.5 - 5 |
| Butyric aldehyde..... | 0.1 - 0.2 |
| Crotonaldehyde..... | 0.05 |
| Acetone..... | 0.3 - 0.5 |
| Methyl ethyl ketone..... | 0.1 - 0.2 |

small amounts of higher alcohols and water; whereas the gaseous fraction consists principally of butadiene and unsaturated hydrocarbons.

A fractionating unit is used for separating the constituents of the liquid fraction coming from the cooler. The ethyl alcohol is recycled through the superheater and utilized. The gaseous fraction from the cooler is purified for the removal of butylene and other hydrocarbons.

To achieve this, the butadiene mixture is pumped into the scrubber tower at the base and made to rise in counter current with the descending butadiene solvent. Turpentine has usually been used as such a solvent. The scrubber tower is packed with petroleum coke and removes from 90 to 92 percent of the butadiene, a large part of the butylene, and a small amount of other gaseous components. The results of the scrubber operation are shown in Table II, where the percentage composition before and after absorption is given.

Unabsorbed gases from the scrubber, consisting principally of ethylene and ethers, are highly combustible, and are used as fuel in the converter furnace. Despite the presence of small percentages of butylene, which can be converted to butadiene by dehydrogenation, the separation and purification of the butylene from the scrubber gas is prohibitive because of the difficulty of separating butylene from the other gases.

Turpentine solvent is passed from the scrubber tower into a separator where the butadiene is distilled from the turpentine, which is recycled and used continuously for the absorption. The butadiene still contains active impurities which are removed by fractional distillation under a pressure of 3-4 atmospheres and by passage through a 50 percent caustic soda solution. The latter operation serves to remove traces of acetaldehyde. The gaseous mixture is subsequently dried. In Table III is given the composition that the product will have at this point.

The final purification step is the separation of butadiene from the butylene and the ethers. The gas is brominated to produce compounds with distinct and more widely separated boiling points, thus permitting efficient separation of these compounds in the fractionating column. Thereupon, the tetrabromobutane, the brominated product of butadiene, is easily reduced by metallic zinc, giving practically pure yields of butadiene.

By reason of the relatively high liquefying temperature of butadiene, storing it in liquid form under pressure is practicable. In Fig. 3 the liquefying pressures of butadiene are plotted against temperature.

The possibility of substituting another purification method is highly probable, since the new method does not require as large a quantity of critical materials of construction. In place of turpentine as an extraction solvent, a mixture of chlorides of

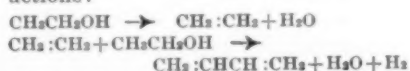
Table II—Composition of Converter Gas Before and After Scrubber Operation in the Direct Conversion of Ethyl Alcohol to 1,3-Butadiene

| Gas | To Scrubber | From Scrubber |
|-------------------------------------|-------------|---------------|
| Hydrogen, % | 40 approx. | 53-65 |
| Oxygen, % | 3-4 | 5 approx. |
| Carbon monoxide, % | 0.5-1 | 1-1.5 |
| Carbon dioxide, % | 1-2.5 | 1.5-3 |
| Saturated hydrocarbons, % | 45-55 | 25-35 |
| 1,3-Butadiene, gm. from 1 L. of gas | 0.5 approx. | 0.05-0.048 |

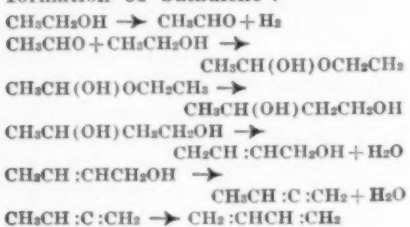
copper and calcium, glycol, and acetonitrile is used, which gives very satisfactory results in that it absorbs about 4.75 cu. ft. of butadiene per gal. of solvent⁴. By repeatedly subjecting the gas mixture to this solvent, the impurities can be reduced to less than 10 percent, of which the greater part is butylene, which is removable by vacuum distillation after its polymerization.

As to the reaction mechanism occurring in the catalyzing chamber, no conclusive data are yet available. Nevertheless, an understanding of the possible reactions underlying the conversion of ethyl alcohol to butadiene may be helpful in bringing about further improvements in the process, and for this reason it is worthwhile to mention two possible mechanisms.

Some believe that the conversion occurs through the formation of an active molecule of ethylene, which condenses under the effect of the dehydrogenating substance with ethyl alcohol, leading to the formation of butadiene⁷. The conversion is represented by the following reactions:



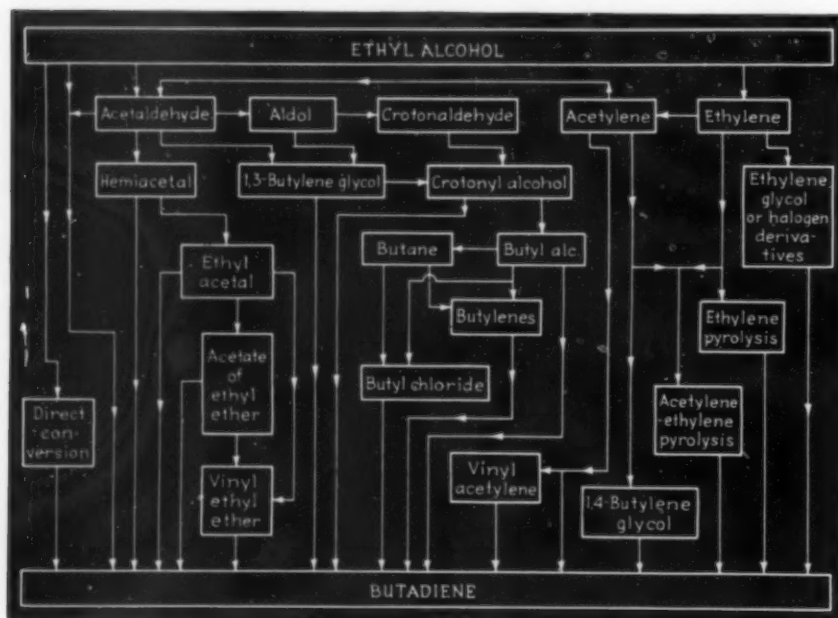
The alternative theory is that alcohol is converted to acetaldehyde, which condenses with an equimolecular quantity of ethyl alcohol, and that the condensation product in turn loses water in passing through a series of changes leading to the formation of butadiene⁸:



OPERATING FACTORS

Problems encountered in the production of butadiene from ethyl alcohol by the direct conversion meth-

Fig. 1—Interrelations between the different methods that can be used for making 1,3-butadiene from ethyl alcohol



od consist mainly in (1) reducing by-product formation and thereby also increasing the butadiene yield, (2) increasing and maintaining the activity of the catalyst, and (3) keeping the fuel consumption for the conversion at a minimum.

Yields as high as 40 percent are obtained by properly controlling the temperature of the catalyst mixture within the range of 400-425 deg. C. Higher temperatures cause the formation of liquid hydrocarbons, these being the result of catalyst inactivation; whereas, lower temperatures bring about the formation of gaseous hydrocarbons other than butadiene. When the vertical type of catalyzing chamber is employed, this is usually heated so that the alcohol vapor charge is subjected to about three times as much heat during its passage through the first third part of the chamber as it is subjected to in the other parts. The reason for this lies in the fact that in the initial reactions involved in the conversion, the amount of energy required is much greater than that consumed in the reactions that follow.

In order to increase the efficiency of the catalyzing chamber and also to prevent fluctuations in the temperature of the catalyst mass, the alcohol vapors are superheated to at least 450 deg. C. previous to injection into the catalyzing chamber. Instead of using absolute alcohol, dilute alcohol, varying from 65-95 percent, is used. This acts as a source of water vapor, though water can also be supplied in the form of steam. The alcohol-water mixture acts as a better heat transfer medium than alcohol itself and also gives more uniform heat distribution throughout the body of the catalyst. The steam tends to absorb the shocks due to sudden variations in temperature and reduces the tendencies toward higher yields of by-products, especially of the resinous and carbonaceous compounds, as the result of the inactivation of the catalyst at higher temperatures. The presence of steam regulates the reaction velocity as well.

In certain instances, air enriched with carbon dioxide is used in con-

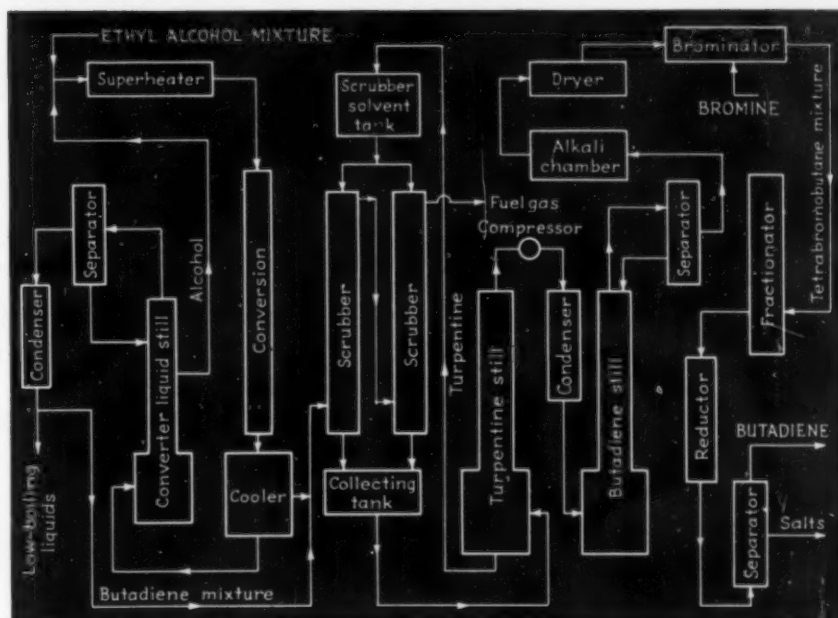


Fig. 2—Flow diagram for the production of butadiene from ethyl alcohol by the direct conversion process

junction with steam as a diluting gas, which mixture of gases serves also as an adjunct for controlling the reaction rate, so that the conversion may not occur instantaneously and thereby cause resination and carbonization on the surface of the catalyst.

Satisfactory yields are obtained with alcohol with as high as 35 percent water content, although the amount of butadiene produced is less than that obtained when using 95 percent alcohol. Ordinarily, 85-95 percent alcohol is used, mainly because of material cost considerations.

Most satisfactory catalyst is a mixture of three parts of dehydrating agent to one part of dehydrogenating agent operating at 425 deg. C. The usual catalyst is a mixture of aluminum oxide for dehydration and zinc oxide for dehydrogenation. However, as dehydrators, uranium oxide or hydrosilicates or basic sulphates of aluminum may be used, and as dehydrogenators, oxides or salts of magnesium or zinc will serve satisfactorily.

The catalyst is prepared so that the shape is worm-like, and varies from 1-3 mm. in diameter. Finer granules cause excessive packing and increase the rate of reaction; whereas, larger granules tend to lower the yield because of the smaller surface area factor. The catalyst mixture should be highly porous and hygroscopic, and to this end care must be taken in its preparation to avoid unnecessary packing and compression of the catalyst. This is important

in that significant decreases of butadiene result by the use of dense catalysts.

Inactivated catalyst resulting, for instance, from resination on the surfaces by high temperatures, is continually re-activated by the oxidation of the coating on the catalyst through introduction of oxygen in the form of air, which is simultaneously introduced with the alcohol-water mixture as a diluting gas.

When aluminum oxide in the pure state is used as a catalyst, large quantities of 1,2-butadiene (methylallene) are produced. This compound does not have the characteristics of 1,3-butadiene that make the latter useful for polymerization to synthetic rubber. In order to prevent 1,2-butadiene formation, or to convert to 1,3-butadiene any of this compound formed, additional heat is required in the presence of the catalyst. The practice is, therefore, to use impure aluminum oxide. The condition of purity of the zinc oxide, on the other hand, is not as important a factor, although the best results are obtained when it is used in a relatively pure form.

The rate of reaction is controlled by the temperature, the catalyst, the dilution gases, and by the rate of injection of the diluted alcohol vapors. The size of the tube is determined by the heating facilities; the larger the diameter, the greater the need for heating the catalyst mass by other means, in addition to heating externally. Heater tubes are installed in the large-diameter tubes in

Table III—Composition of Direct Conversion Product After Initial Purification

| Components | Percentage Composition |
|---|------------------------|
| Butadiene..... | 77-80 |
| Butylene (pseudo-butylene or butene-2)..... | 20-15 |
| Ethers of more than 5 carbons..... | 3 approx. |
| Acetaldehyde..... | less than 1 |

the mass of the catalyst. The addition of steam, as already mentioned, helps to conduct and distribute the heat within the converter tube.

Secondary factors appearing in the conversion are those that are related to the material of which the catalyzing chamber is constructed. Enamel-lined tubes are used because of their resistance to corrosion and because they have no detrimental effects on the catalyst or the reaction. Furthermore, it has been observed that in glass tubes the butadiene begins to form at 360 deg. C.; whereas linings of nickel require 440 deg. C., and those of aluminum require 500 deg. C.³

Condensation of the reaction products keeps the pressure of the system below atmospheric, but the decrease in pressure, amounting to 50-80 mm. of mercury, is not sufficient to produce the required velocity of gas flow in the converter for adequate removal of the products. Vacuum pumps are, therefore, used to reduce the pressure to about 0.25 atmosphere. These pressure conditions give sufficient gas flow in the converter to maintain an equilibrium shift for efficient conversion and, in the same operation, the gaseous products are also separated from the liquid products.

BUTADIENE BY ALDOL METHOD

A process widely used in Germany and proposed in the United States is the aldol method for the manufacture of butadiene. This process involves the conversion of either acetylene or ethyl alcohol to acetaldehyde, the choice between acetylene or ethyl alcohol depending upon the availability of these materials at the point of production.

Dehydrogenation of ethyl alcohol to acetaldehyde occurs at 250-350 deg. C., but the rate of reaction is too slow for commercial application. Copper and silver or certain of their compounds are the usual catalysts

used for accelerating the reaction. The form of the equipment and the operating conditions vary considerably among the different manufacturers using this process. Within the last fifteen years a number of patents have been issued that cover chiefly the use of the catalyst and temperature control. In general, however, the method consists in passing a mixture of preheated alcohol, water vapor, and air over the catalyst. The temperature recommended for the reaction zone of the converter varies widely and ranges from 250-650 deg. C.

Immediately upon leaving the converter, the mixture is cooled to about 15 deg. C. This separates the inert gases and unutilized oxygen from the condensable fraction, which consists almost wholly of acetaldehyde and unconverted ethyl alcohol. The gaseous portion is recycled as a diluent and the liquid portion is treated for condensation of the acetaldehyde to aldol by mixing the acetaldehyde with a solution of caustic soda or soda ash. A 2:1 mixture of acetaldehyde and a 1.25 percent solution of caustic soda may be used.⁹ Methods for bringing about the condensation using soda ash, and also a method using a neutral condensing medium buffered with sodium acetate have been proposed and are covered by patents.^{10,11} The condensation occurs with almost quantitative yield. Usually no initial accelerating factor is necessary. The temperature is held between 0-20 deg. C. From the aldol condensation chamber the mixture is fed to a fractionating column for removal of unused acetaldehyde. This mixture of aldol with water and some ethyl alcohol that has come through from the alcohol-acetaldehyde conversion is then acidified so as to bring the pH within the range of 1.5-6.0, but usually to about 4.8, with acetic acid.¹² Only small amounts of acid are required to neutralize the small percentage of alkali employed for the aldol condensation.

The acidified solution of crude aldol and alcohol is then pumped into the top of a vertical, cylindrical high-pressure vessel having an interior lining of acid-proof material, and which is packed with a catalyst consisting of finely divided copper deposited on Fuller's earth. The catalyst must be entirely free of alkali. The temperature is regulated so that the upper half of the chamber does not exceed 80 deg. C. nor go below 60 deg. C., whereas the lower half is heated to 120 deg.

As the solution enters the top and passes down over the catalyst, hydrogen under pressure of 90 atmospheres is also forced in at the top and the product is removed continuously from the bottom of the chamber. The rate of catalysis is regulated chiefly by controlling the discharge of product from the base, but to some extent also by varying the hydrogen feed. Since the aldol is completely hydrogenated, the product is essentially an aqueous solution of 1,3-butylene glycol and ethyl alcohol with sodium salts of acetic acid.

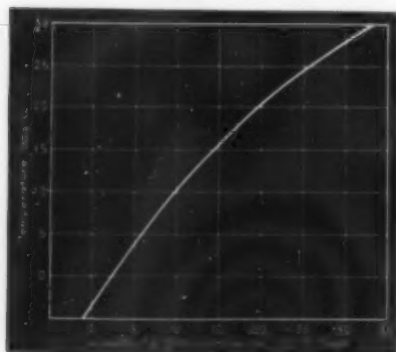
In the succeeding step of separating the alcohol and some of the water from the mixture, the resulting solution of butylene glycol is preheated enough to be passed directly into the dehydrator, which consists essentially of a column still.¹³ The dehydrating agent can be supplied directly to the still with the butylene glycol. Sulphonic acids together with sulphuric acid are used, as well as a number of other dehydrating agents. It is important that the mixture of butylene glycol and catalyst be slowly preheated before it is fed into the dehydrating still in order to prevent excessive foaming and resinification of the glycol and catalyst.

Dehydration can be carried out as a continuous operation until the accumulation of by-product residue in the still becomes too voluminous. Hereupon, the butylene glycol supply is interrupted and the temperature of the still gradually raised as long as butadiene is evolved. The residue is then drawn off from the still. The butadiene and vaporized liquids are conducted from the top of the column to a condenser operating with water at about 18 deg. C., whereby the intermediate products and water are separated.

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Fig. 3—Liquefying pressures of 1,3-butadiene



CHEM & MET REPORT ON

Production and Maintenance Equipment at the Shows

TO PRODUCTION MEN AND EXECUTIVES OF PROCESS INDUSTRIES

Although the War has left its definite imprint on the equipment shows, there is still much that chemical engineers can learn from two that have just been held: the Second National Chemical Exposition, in Chicago, and the fifteenth National Power Show, in New York. The first of these, a relative newcomer, was larger than its predecessor, but still much smaller than the last Exposition of Chemical Industries, that is, the New York Chemical Show. The Power Show had shrunk by about 50 percent as compared with the exposition of two years ago. In each case, attendance was excellent and much better than would be expected, considering travel restrictions and the difficulties which busy engineers now find in breaking away from their jobs. In the main, few exhibitors at either exposition found it possible to show startling new developments. A surprising feature was the comparative lack of emphasis on maintenance methods and on new materials, or materials which are readily available to substitute for those which are scarce. Still, the editors feel that enough in the way of new ideas was uncovered amply to justify a perusal of the seven pages which follow.

CHEMICAL AND METALLURGICAL ENGINEERING • DECEMBER, 1942

Production and Maintenance Equipment at the Shows

SUMMARY AND CONCLUSIONS

Although they were to a considerable extent curtailed by the restrictions of wartime, two expositions which have recently been held have made it possible for chemical engineers to pick up a surprising amount of information on new developments in production equipment and apparatus. To a somewhat lesser extent, these expositions also served as idea sources on maintenance of the vitally needed equipment already in use, and on possibilities for materials substitutions available to engineers who cannot secure metal critically needed in the war effort.

Somewhat surprisingly, the question of maintenance methods was not emphasized to nearly the extent that would be expected in these days when it is necessary to secure the last ounce of production from equipment already installed. Equipment exhibitors were, of course, ready and willing to discuss the best means for the conservation of the equipment they made. A relatively small number of exhibitors emphasized maintenance methods, including the welding torch, metal spray gun, and new types of welding elec-

trodes. Tool manufacturers exhibited new tool developments to assist in maintenance, while several producers of refractory coatings were present to show how such coatings are employed to increase the life of high temperature masonry structures.

In the case of materials substitutions, examples were more numerous. Considerable cast iron was used where steels and other metals had been employed before, while wood was shown substituted for metals and for plastics, and plastics also were substituted for metals. For example, pulleys and sheaves of wood were in evidence, substituted for cast iron and steel. Both wood and plastics were employed for fan blades. Plastics were substituted for rubber in truck wheels. One rather surprising substitution was the use of platinum in a corrosion-resisting heat exchange application, rather than the unobtainable tantalum normally used in this application. The NE steels were in evidence, substituted for higher alloy steels, while steam specialty manufacturers showed many uses of cast iron, where brass had formerly been employed.

The Chemical Show

CHICAGO entertained the second National Chemical Exposition sponsored by the Chicago Section of the American Chemical Society and held during the six days, November 24-29, at the Hotel Sherman. (This exposition was briefly previewed in our November issue, on the basis of material supplied to us by a number of the exhibitors.) *Chem. & Met.* editors considered this exposition carefully from the standpoint of new production equipment which had been developed or announced in the two-year period since the first Chicago Chemical Exposition, held in 1940.

Wartime restrictions prevented many exhibitors from showing their new developments. Some of these are being held for announcement after the war, while others could not be displayed on account of equipment stringencies and transportation restrictions. Nevertheless, a considerable number of new developments

in production equipment, construction materials and process control equipment and apparatus was uncovered.

Under the classification of production equipment may be mentioned the Denver Hydroclassifier, manufactured by Denver Equipment Co. This is a fine sizing and de-sliming machine, consisting of a shallow cylindrical vessel with a slightly coned bottom, equipped with a spiral rake for moving settled material to the central discharge. Provided with an overflow launder around the periphery, the machine is used for accurate separations in the range of 100 mesh and finer. The feed is brought into a center feed well and distributed in a quiet zone, the coarser material settling to the sloping bottom and the finer material overflowing the circular rim into the launder.

The Hydro-Treator shown by the Dorr Co. is a new self-contained

water treatment unit for purifying industrial water supplies by means of softening, and turbidity or color removal. Feed enters the bottom of the cylindrical tank through orifices in a rotating distributor, immediately above which is a mechanical agitating zone in which flocculation takes place. After flocculation the clarified water overflows at the top of the unit through an annular effluent channel, while the solids settle into a central sludge cone where they are thickened and withdrawn through a sludge pipe. A substantially constant amount of solids remains in the flocculation zone to form a sludge blanket for the entrainment of fine solids.

For acid-resisting applications, Ertel Engineering Corp. has introduced a new pump made of a relatively non-critical plastic material. The new pump is of the gear type, with both the body and the gears made of fabric-reinforced plastic. These pumps are self priming and are suitable for handling hot liquids

up to 200 deg. F. They are provided with a built in stainless steel manual bypass for pressure and flow control, and are available for both direct and belt drive in sizes delivering from $\frac{1}{4}$ to 50 gal. per min.

Fansteel Metallurgical Corp. exhibited several new developments in hydrochloric acid and anhydrous HCl equipment. A new cooler for acid gases consists of Karbate impervious carbon tubes in series, arranged one over the other, with a water distributing system above the top-most tube, and splash boards between tubes to distribute the water flowing from one tube over the next tube below. A chamber preceding the entrance end of the cooler proper, also constructed of Karbate, is used for the spray cooling of the hot gas as it enters, to obtain an initial radical drop in temperature. Several types of flowsheet have been developed by this company for the production of anhydrous HCl by distillation with strong sulphuric acid. The company has also evolved new hook-ups for the absorption of HCl in water to produce acids of various strengths, from various strengths and sources of gas.

A tumbling barrel type of mixer which can be remotely controlled for use in the manufacture of explosive powders and pyrotechnics was exhibited by the Globe Machine and Stamping Co. The barrel has been adapted from this company's tumbling barrels for metal finishing and consists of a mixing cylinder in the form of a truncated cone, supported at one end at its central axis and rotated above this axis at any angle to the horizontal which is desired. The inner end of the barrel is formed at an angle to the axis in such a way that material placed in the barrel is forced to slide back and forth as the barrel rotates at an angle slightly above the horizontal. Both the hand-wheel which controls the angle of tilt and the drive motor may be remote from the mixer, on the other side of a partition.

A novel idea in filtering equipment, developed primarily for the filtration of coolants in metal machining operations, but very possibly of direct application to process industry uses, was shown by Olson Filtration Engineers. The Olson coil-spring filter consists of a horizontal trough in which is a horizontal shaft carrying two disks between which a large number of tightly wound coil springs are hung. One disk is solid while the other is hollow, serving as a header connecting with the interior

of the coil springs. The shaft is hollow, connecting with a vacuum pump, but this shaft can also be rotated. The assembly of shaft and springs is submerged in the liquid to be filtered which is then drawn through the interstices between the adjacent coils of the springs by means of the pump. Solids are caught on the outside of the springs which, in effect, act as porous pipes. At the end of the filtration cycle, when cleaning is necessary, the filter assembly is rotated by means of a handwheel, thus stretching the springs slightly by centrifugal force and breaking up the accumulated mass of insoluble particles which are completely washed from the surfaces and spaces between the coils.

New developments in chemical feeding and lime slaking equipment were shown by Omega Machine Co. The company's gravimetric feeder for water treating chemicals employs a novel feed method. A continuously driven conveyor belt is balanced on a scale beam so as to weigh the amount of material on the belt. This weight is communicated to a mechanically operated vibrating device which drives a vibrating apron suspended beneath the feed hopper at such a rate as to deliver material to the weighing belt at the rate desired. Should the weight increase, the vibration of the feed apron decreases, and vice-versa. The mechanical vibrator consists of a pair of jaws tapering toward the bottom, between which is suspended a resilient wedge. One jaw is mechanically oscillated through a fixed amplitude. The other jaw is connected to the apron feeder. The resilient wedge, which is suspended from the scale mechanism, serves to communicate all or a part of the motion of the first jaw to the second

and hence to the feeder. The lower the wedge rides in the opening (less weight on the scale), the more motion is communicated to the feeder and the faster it feeds. If the weight on the scale increases beyond the desired amount, the wedge rises and communicates less motion.

The company's lime slaker, which is used in conjunction with the feeder just described, consists of a tank with a single slaking compartment, having a clinker trough at the front, vapor removal equipment on top, an agitator and a thermostatic control valve. The slaker has a range of 30 to 360 lb. per hour with an accuracy, according to the manufacturer, within 2 percent. A multi-compartment slaker can be provided, with a capacity up to 3,000 lb. per hour.

This company also showed a novel type of variable speed drive for volumetric feeders. The driven shaft carries two cams of special shape which are both eccentric and roughly conical in appearance. This shaft may be displaced in an end-wise direction for speed adjustment. Riding on the cams are arms connected to free-wheeling clutches on the output shaft. Rotation of the cams on the input shaft causes alternate oscillation of the two arms and hence rotation of the output shaft. Contrary to the performance obtained with certain other transmissions which resemble this one, the shape of the cams is such that the angular velocity of the arms is linear rather than harmonic, so that a uniform rate of rotation of the output shaft is obtained. Output speed may be adjusted in an infinite number of steps between zero and a maximum.

Two totally new ideas in the realm of capillarity were shown by the

(All illustrations from the Power Show, New York, 1948)



Selas Co. Endeavoring to determine uses for its Microporous ceramic filters, outside the normal applications for such filters, the company has completed preliminary development work on two applications which may eventually lead to important industrial uses. One case can be described as a "motionless centrifugal." Two filters are employed, one treated to permit the passage of water while it repels oil, while the other is hydrophobic, treated to pass oil and repel water. The device is capable of separating a rough emulsion of oil and water into its pure constituents, the water passing through the hydrophilic filter, and the oil through the hydrophobic filter. On the other hand, it has been noted that such filters can be used conversely, through the application of higher pressures, to produce an oil-in-water emulsion with a hydrophobic filter, and a water in oil emulsion with one which is hydrophilic.

Another surprising use for these filters is for pressure relief. When a ceramic filter is saturated with water, the capillary effect will hold the water in the pores against the pressure of a gas inside the filter, until the pressure rises to some value dependent on the pore size. Once this value has been reached, the water is blown from the pores and thereafter the gas passes readily. It is possible to control the pore size over a considerable range so as to obtain filters having bubbling pressures ranging from a fraction of a pound to well over 100 lb. per sq.in.

Several improvements were shown in the Pulsafeeder manufactured by Wilson Chemical Feeders, Inc. Whereas the first of this company's feeders employed a pulsating tube as the pumping element, later de-

signs also include models using a pulsating diaphragm. A late model is completely inclosed, presenting a streamlined appearance, with only the stroke adjustment and the inlet and discharge connections outside the casing. Pumps manufactured by this company all operate on the same principal, namely a motor-driven reciprocating plunger drives a piston working in a liquid cylinder. By means of an adjustable stop, the stroke of the liquid piston can be varied. The liquid, which is neutral in character, then causes alternate compression and expansion of a tube of plastic material, or causes reciprocation of a diaphragm. Thus, the only moving parts in contact with the liquid being pumped are the valves and tube or diaphragm.

CONSTRUCTION MATERIALS

A variety of improvements in construction materials and methods of equipment construction were in evidence. New flux-coated aluminum bronze welding rods were shown by Ampeo Metal, Inc., having strength up to 100,000 lb. per sq.in., and hardness up to 350 Brinell. These rods, suitable for gas, metallic or carbon arc welding methods are said to combine ease of handling, smooth arc action and marked freedom from porosity. The rods possess properties similar to this company's Ampeo metal. The coating used on the rods makes it unnecessary to use a separate flux.

A new coating for metals, shown by Chicago Vitreous Enamel Products Co. and known as Armor-Vit, is now available for resistance to corrosion, heat, impact, and abrasion. Said to be resistant to both acids and alkalis, the coating is produced in colors ranging from gray to black and may be applied by means of a spray gun. The coated metal is

then baked at a temperature ranging from 250 to 800 deg. F.

Among the newer applications of Corning Glass Works' recently developed Vycor 96 percent silica glass, was a thermocouple tube made for use at high temperature, as a substitute for high temperature metallic protection tubes.

That paper has many substitution possibilities was evident from a sample of laminated paper pipe made by Federal Electric Co. Paper is laminated with Vinsol resin, producing a pipe which is said to be equal to steel mechanically on a weight-for-weight basis and suitable for use as an electrical conduit or for temporary low-pressure piping.

Some of the things that can be done with the new plastic, Saran, in the production of pipe, fittings, couplings and tubing were shown in the exhibit of the Havgar Corp. This material is available as small-diameter tubing, and in iron pipe sizes from 1 to 2 in., with larger sizes to be made in the future. It is readily welded at 350-400 deg. F., and can be threaded with ordinary pipe tools. Fittings are easily fabricated by cutting and welding, and standard flanges and tubing couplings are available.

A complete line of chemical porcelainware pipe, fittings and valves in sizes from 1 to 6 in. was exhibited by Illinois Electric Porcelain Co., a newcomer in the field of chemical porcelainware. Pipe and fittings have ground ends for gasketing. In addition to the standard line the company is prepared to supply special shapes such as crosses, Y-branches, and similar pieces. Valves are produced in both Y and angle designs in sizes from 1 to 4 in. Raschig rings are produced in sizes from $\frac{3}{8}$ to 3 in.

For simplified lead burning, the Insto-Gas Corp. showed a new lead-burning torch for use with the bottled petroleum gases distributed by this company. Use of the torch is readily learned by any mechanic, according to the manufacturer, although it is not claimed that the torch is suitable for use on more complex lead-burning problems.

Several new applications of the chemical porcelainware manufactured by Lapp Insulator Co. were in evidence at the exposition. In the Lapp booth was a flush-bottom outlet valve for glass-lined kettles and tanks, designed and manufactured in cooperation with the Pfaunder Co. Made in sizes for 3, 4 and 5 in. I.D. outlets, the design features a porce-



lain plug and seat, so arranged that the plug can be turned to grind away crystals or dirt on the seat before it is tightly closed. The Pfaudler Co.'s booth also contained a somewhat similar sort of outlet valve design, combining glass-coated steel and Lapp porcelain. Another co-operative effort shown by the Lapp concern was a porcelainware pump, designed and manufactured by Worthington Pump & Machinery Corp., using a volute, impeller and shaft sleeve of porcelainware.

New members of the Tygon family of synthetic resin materials were shown by the U. S. Stoneware Co. The material can now be used not only for the lining of tanks and pipes to meet a variety of corrosive conditions, but for the impregnation of fabrics, for extruded tubes, for the shatter-proofing of glass, for the insulation of wires and cables, for the manufacture of tubing couplings and, in one new form, as a "strip-pable" film for the temporary protection of highly finished surfaces.

Structural carbon is constantly finding new applications. One novel use was a leaf for a rotary filter, shown by Goslin-Birmingham Mfg. Co. The body of the leaf is formed from Karbate impervious carbon, while the filtering surface is of porous carbon.

PROCESS CONTROL

Several new developments in equipment and apparatus having a bearing on process control were exhibited, although very few of the manufacturers of industrial instruments were represented. The Graver Tank & Mfg. Co. showed a new controller for the feeding of chemicals, claimed to be accurate within 2 percent at all flow rates. The primary element is a contact meter which signals the control apparatus when each increment of liquid to be treated has flowed in predetermined volume through the meter. The controller turns a drum through a predetermined amount at each impulse, the drum paying out a cable which is connected to a swing pipe draw-off line installed in the tank containing the reagent chemical.

The new Empire thermostatic drum filler, exhibited by the National Meter Division of Pittsburgh Equitable Meter Co., has a number of novel features. The filler is started by opening a quick-opening nozzle valve. The meter then operates until a predetermined volume of material (automatically corrected to the density at 60 deg. F.) has passed,

whereupon the nozzle valve trips shut. Any quantity from 10 to 100 gal. per cycle can be discharged, the control of quantity consisting of a "quantity chain" on which is a lug to trip the closing device. The chain is driven by the meter until the lug and tripping device meet. Thus, the length of chain employed determines the delivery cycle.

Several new models of its Magnetrol level controller were exhibited by Fred H. Schaub Engineering Co. This device consists of a float to which is attached an armature, the latter rising and falling in a non-magnetic metal tube. Outside of the tube is a balanced high-intensity permanent magnet connected to a mercury switch in such a way that when the armature comes within the field of influence of the magnet, the magnet is attracted toward the armature, tipping the mercury switch so as to make or break the contact. New types include high-pressure models, multi-point controls, controls for extreme differentials, and types adapted to explosion-proof, weather-proof and splash-proof service.

Wheleo Instruments Co. showed several of its more recent developments in level controllers of the remote type, employing electronic actuation. The method is adapted to the control of level, interface and flow, using pick-ups which may be either inductive or capacitive. A vacuum tube oscillator connected to the pick-up is tuned when an object enters the field of the latter, resulting in a current change which operates a relay. Or, a liquid may serve as one plate of a condenser, the capacity of which is changed as the liquid level changes.

Several new pieces of apparatus for routine analytical control of

chemical processes were on display, including the new infra-red spectrophotometer developed by National Technical Laboratories. This device, now available only for war industry use, is being employed primarily for the analysis of hydrocarbon mixtures by spectral absorption in the infra-red region between approximately 2 and 12 microns. It consists of an infra-red source, monochromator, absorption cell and associated gas handling system, thermocouple and galvanometer. At present the instrument is being used chiefly in the production of aviation gasoline and synthetic rubber.

Other new analytical instruments for the petroleum industry were exhibited by Podbielniak Centrifugal Super-Contact Co. This apparatus included automatic and semi-automatic devices for fractional distillation for use in controlling such operations as alkylation, catalytic cracking, and the manufacture of butadiene. One type is suited to the super-fractionation of motor fuels, styrene mixtures, creosote, etc.

The emphasis of the exhibit of the Permutit Co. was on the application of its ion exchangers, not for water treatment alone, but primarily for use in a variety of industrial processes. Consideration has been given to such applications recently, with the development of the resinous ion exchangers. It is believed that by the use of proper types and combination of types of ion exchangers, economical processes can be developed for the recovery of valuable electrolytes present in solutions; removal of small quantities of ionic impurities from low-cost products; separation of electrolytes from non-electrolytes; separation of ions from ions of different valence; catalysis; and purification of gases.





The Power Show

Always held during the week of the Annual Meeting of the American Society of Mechanical Engineers, the National Power Show occurred November 30 to December 5, at Madison Square Garden, in New York. In many ways, the 1942 Power Show differed materially from those which have gone before. For example, much less heavy equipment was in evidence, boiler manufacturers were conspicuous by their absence, and few industrial instrument manufacturers were present. Pipe and fittings had few representatives, and motor and electrical control manufacturers were missing.

In the field of power transmission, American Pulley Co. exhibited new compressed plywood sheaves for V-belt drives which were originally developed for powder plant use, shortly before the metal stringency began to make itself felt. The company showed new plastic wheels for materials handling trucks, and exhibited its new reduction drive, a simple 13-to-1 gear reducer in a cylindrical casing which is mounted without separate foundation on the shaft to be driven. By varying the ratio of the V-belt drive which turns the high-speed shaft of the reducer, any driven speed between 11 and 154 r.p.m. can be secured. The company also showed a new line of endless cord transmission belts constructed of fabric, cord and rubber, prestretched and highly flexible to conform to the pulley of a short-center drive without absorbing internal stresses.

Dodge Mfg. Corp. showed a new line of wood V-belt sheaves and pulleys of laminated construction. The solid pulleys are built entirely without the use of metal, except for

a setscrew. A few bolts only are required for the larger pulleys.

The latest member of its line of variable-speed transmissions developed by Reeves Pulley Co. is the Vari-Speed Jr., shown in this company's booth. It is similar to the original Vari-Speed drive, except that it is smaller, for a lower rating, and employs a V-belt instead of a flat belt with tapered edges. The motor pulley is a variable sheave consisting of two opposed conical disks mounted on the shaft and forced together by means of a spring. The motor is mounted on a screw-adjusted sliding base for controlling the effective pulley diameter.

LUBRICATION EQUIPMENT

Two manufacturers showed interesting developments in forced-feed lubrication equipment. A new distributor for oil which handles four bearings automatically was shown by the Nathan Mfg. Co. This device receives oil from a standard piston-type lubricator and uses this oil, first to supply motive power for its own operation, and then for distribution to four points to be lubricated. The distributor contains four cylinders arranged radially, 90 deg. apart, and has pistons, the opposing pairs of which are coupled together. Pressure of the oil on the first piston causes it to move inwardly, discharging the oil contained in the opposite cylinder. This movement causes a partial rotation of the piston, which automatically valves the oil pressure to one of the second pair of pistons. As long as pressure is supplied, the device operates continuously, delivering equal discharges of oil to each of the four bearings connected to its ports.

A new multiple-outlet, positive, forced-feed system of lubrication, using either oil or grease, was shown by Trabon Engineering Corp. The system comprises a lubricant reservoir feeding a variable stroke three-piston rotary pump, with a maximum capacity of about 1 lb. of grease per hour. A block of distributors for six or more outlets is connected to each of the three pumps. Each distributor unit has two outlets, a block comprising three or more units. If desired, any one of the outlets may serve another block of distributors instead of a single bearing. Each unit is machined from a solid steel bar and contains a four-lobe piston which reciprocates under oil or grease pressure, discharging from each end. The system is so hooked up that each block of distributors must discharge in a definite sequence at the various outlets, delivering a definite quantity of lubricant. It is impossible for any outlet to be bypassed.

New developments in materials handling equipment were shown by several manufacturers. Barrett-Cravens Co. exhibited the PowerOx, a combination hand and electric lift truck which provides a manual hydraulic lift, but is moved to its destination by electric power. Control of the electric drive is exerted by a button on the handle which is used for lifting the load and guiding the truck. The truck is driven by two motors, one for each rear wheel and has a capacity of 4,000 lb.

Lewis-Shepard Sales Corp. showed its new center-drive electric- and gas-powered telescopic fork trucks. These machines, which are practically identical, except for the power source and for operating speed, both have a 3,000-lb. capacity, and a 9½-ft. lift. The electric model lifts the full load at 18 ft. per min., and the gas model at 30 ft. per min. The former has a 5-6 m.p.h. traction speed, and the latter, a speed of 7.5 m.p.h. Both tilt and hoist by hydraulic power, and both feature an exceptionally small turning radius.

Service Caster & Truck Co. showed its new Lever-Lift hydraulic lift truck in which the handle is used only for pulling and guiding, while a separate lever on top of the hydraulic mechanism is used to lift the load. This company has now standardized on a line of lifters of the telescopic type, which formerly were built special to customers' specifications. These lifters are hydraulically operated, and since they do not require a reversing motor, can read-

ily employ explosion-proof electrical equipment. Control is by means of a two-button switch on the end of an 8-ft. cable.

Little new control equipment was on display. Brooke Engineering Co. showed its new photo-electric smoke indicators and recorders, and a new automatic combustion control system, using an electronic relay, which combines the more conventional control functions of draft and pressure with photo-electric examination of the flue gases to maintain the optimum smoke color. Operation of this control depends on the fact that the flue gas color changes for each fractional percent change in CO_2 when operating near the maximum efficiency point of the furnace. The control integrates the effect of draft control, steam pressure, fuel rate, and flue gas color, the last-named function using a time-delay electronic relay to adjust the forced-draft air regulator. The company also demonstrated a similar electronic relay in use for flow control, as with a rotameter flowmeter.

Among other new electrically operated timers, R. W. Cramer & Co. showed a new multiple-contact timer of the programming type, using double cams for each circuit to obtain quick "make" and "break" action. Since the double cams are mutually adjustable, the time between make and break for each circuit can be readily adjusted.

Among the instruments exhibited by Cambridge Instrument Co. was a new combustible analyzer designed primarily for determining the total CO and H_2 in the exit gases of industrial furnaces operating under reducing conditions. This instrument employs a variation of the thermal conductivity method. The gas is first analyzed as received by passing through one thermal conductivity unit, after which the CO is converted to CO_2 and the H_2 converted to water by contact with hot copper oxide, heated electrically. The gas then passes through the second unit of the thermal conductivity bridge, and the differential is recorded as total combustible.

Maintenance equipment at the show included an improved metal-spray gun, the Mogul Gun, Model P, shown by the Metallizing Co. of America. This heavy-duty gun uses any fuel gas without adjustment. It is said to provide finer atomization and positive wire feed, with a turbine powerful enough to straighten even kinky wire without fluctuation.

A new device for holding work

to be welded in the most favorable working position was shown by Lyon-Raymond Corp. This device, which is operated hydraulically, comprises a tilting table on which the work is secured, designed to support 2,000 lb. It can be raised or lowered, tilted at any angle from vertical to horizontal, and rotated through 360 deg.

FLUIDS HANDLING

Among devices for the handling of fluids was an interesting universal gear joint for the operation of shafts at an angle, primarily for valve control. The device is hinged so that the two shafts may operate at any angle from zero to 92 deg. The gears are of a unique ball-and-socket design which mate properly at any angle of use within the range of the equipment. The range of available sizes is from $\frac{3}{4}$ to 2 in.

New pipe and insulation assemblies for underground use, prefabricated at the factory, were shown by the Ric-wil Co., for use in underground lines handling steam or liquids which must be kept warm. Standard units consist of a 20-ft. length of one or more pipes, packed in insulation and inclosed in an asphalt-coated corrugated tube, covered with asbestos felt. Units are assembled on the job by welding, after which the uninsulated ends of the pipes in adjacent units are insulated and sealed.

Among the proportioning pumps shown by Milton Roy Pump Co. were a number of newly developed models, showing a new method of stroke adjustment, new methods of inclosing the valves, and also plastic chambers for the step inlet and outlet valves which are used in the handling of corrosive liquids.

Developments in refractories and insulation, as well as in their use,

were shown by several manufacturers. Armor-Clad Co. showed its new No. 200 Torrid coating for refractories, which produces a glazed and sealed monolithic coating on the brick, said to resist slagging and spalling. The coating is applied either with a brush or spray-gun, becoming glazed and bonding to the brick as soon as the vitrification point is reached when the furnace is heated. The coating is suitable for temperatures up to 3,000 deg. F.

Its new 9-lb. insulating board for low-temperature applications and roof-deck insulation was shown by Owens-Corning Fiberglas Corp. The glass fibers are compressed to 9 lb. per cu.ft. at which point substantially the maximum insulating efficiency is said to be obtained. The insulation is treated with a special thermosetting binder, and the surface provided with a heavy asphalt coating for water-proofing in some types, or with a heavy fiberboard surface on one side for other applications.

Several new methods of supporting refractories in industrial and boiler furnaces were shown by George P. Reintjes Co. One new design is adapted to the refractory lining of a horizontal cylindrical furnace shell, developed particularly for a new wartime chemical application. A hollow box casting, which is readily kept cool, supports an X-shaped casting which may be slid onto the box structure at any point and locked into place. The X-casting supports the refractory rigidly in all circumferential directions so that each block in a ring is independent of the blocks adjacent to it. This company showed a new air-cooled refractory air nozzle for furnaces, and exhibited a new design for the refractory outlet-constricting cone now being used in the Iso-Flo ver-





tial, cylindrical oil-industry furnace. Still another new development was a cast pipe hanger developed as a substitute for steel I and U bolts, for the support of horizontal pipes.

A variety of other new developments, hard to classify, were also found at the show. For example, American Car & Foundry Co. exhibited its new Berwick low-voltage electric screen heater, a device which will heat any metal screen in order to dry moist particles which otherwise would cling to the screen, and also to prevent the freezing of wet materials in winter when the screening is carried on in unheated spaces. The screen itself is used as the resistance heater.

Another case of materials substitution was found in the acoustical telephone booth for use in noisy factory locations, made by Burgess Battery Co. Formerly this company's booths were lined with perforated metal backed up by a sound-absorbent material. Perforated plywood has now been substituted for metal with equally good results.

Appropriate these days of possible aid raids is the line of steam and air operated sirens for industrial use, shown by Foster Engineering Co. These sirens reach their peak of sound in 3 to 5 sec. and can be used for signalling because of sharp sound cut-off. The smaller size produces a sound level of 112-115 decibels at 100 ft., while the larger size produces a level of 125-130 decibels. Either steam or air can be used as the motive power.

Hartzel Propeller Fan Co. exhibited ingenious new three-ply birchwood propeller blades which are being substituted for aluminum in its propeller-type fans. These blades are pressure impregnated with a

plastic to give high strength and moisture resistance. The company also showed a laminated plastic cooling tower fan with a metal hub and adjustable-pitch blades, available in 10- and 12-ft. diameters. The larger size is said to save 450 lb. of aluminum per fan.

An interesting type of wet dust collector of high collecting efficiency, available in sizes of 2,000 to 40,000 c.f.m., was shown by Industrial Sheet Metal Works. Water flows over a weir and down a sloping baffle where it meets an upward current of air which carries the dust to be collected. The water is picked up in a fine dense spray which is then eliminated from the air as it travels upward through the apparatus by passage around a number of additional sloping baffles projecting from either side of the path.

STOKER IMPROVEMENT

Its latest development in pneumatic spreader-type stokers was shown by the Iron Fireman Mfg. Co. This stoker conveys steam-size coal from a hopper or main coal bunker to a transfer housing by means of a screw. In the housing, the coal is picked up by a stream of air, generally preheated, and is conveyed to the furnace through a pipe and adjustable spreader nozzle. The fines burn in suspension, while the larger pieces form a shallow fuel bed on the flat grate. The conveying air provides the over-fire air which enters with maximum turbulence, producing a desired effect in securing efficient and smokeless combustion.

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A single nozzle is provided for units burning up to 1,600 lb. of coal per hour, and for higher burning rates, multiple nozzles are used. The feed hopper can be located at any desired point, above or below the furnace, or at one side.

Coal Specialties Co., in cooperation with the Liquid Carbonic Corp. showed an interesting new method of extinguishing coal-pile fires through the use of dry ice. At present, with the necessity of storing vast quantities of coal, spontaneous combustion has become a serious problem. When any method of determining overheating, such as Coal Specialties Co.'s Hot Spot indicators, shows the location of trouble, a pointed 3-in. pipe, perforated at the bottom, is driven into the coal bed, and lumps of dry ice are dropped down the tube. Bottom draft is then eliminated by sealing the coal pile to a height of several feet with building paper, or other impervious material. About 50 lb. of crushed dry ice is used in the pipe, which is then capped.

A valuable improvement in the packing of its proportioning pumps for the handling of corrosive liquids, was exhibited by Proportioners, Inc. The method is simple but effective. It consists in forming a trough at the outer end of the stuffing box, which can then be filled with a liquid, such as a neutral oil, which will exclude air from the reciprocating pump shaft. Only one or two rings of packing are required on the stuffing box at the rear end of the trough.

A device for remote control of quick-opening valves, variable speed transmissions, throttles, and other controls, was exhibited by Sperry Products, Inc. The device, known as the Exactor hydraulic control, consists of a transmitter and receiver coupled by a single length of tubing. The transmitter and receiver are practical identical in construction, each containing a hydraulic cylinder and piston, the latter connected to a rocker arm. The opposite end of the rocker arm is forced upward by a heavy spring. The transmitter handle can be moved through any angle up to 50 deg., moving its piston and thus moving the receiver piston a like amount. When the handle is released the springs in transmitter and receiver return their handles to the initial position. The control will deliver 100 in.lb. torque on the suction stroke, and twice this or more on the pressure stroke.

Machinery, Materials and Products

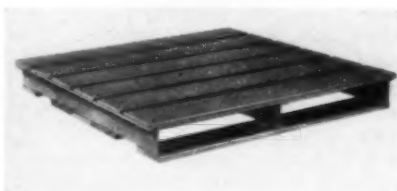
Steel-Saving Pallet

IN LINE with efforts being made to conserve steel for the war effort, Union Metal Mfg. Co., Canton, Ohio, has developed a new pallet for materials handling, consisting of top and bottom wood slats, reinforced with steel at the ends and in the center. Bolted construction permits easy replacement of the wood slats, while the steel ends protect the pallet from damage by power fork trucks. It is claimed that this conservation of metal is accomplished without sacrificing strength, ease of handling, or all-around usefulness. Sizes for all ordinary materials handling requirements are available.

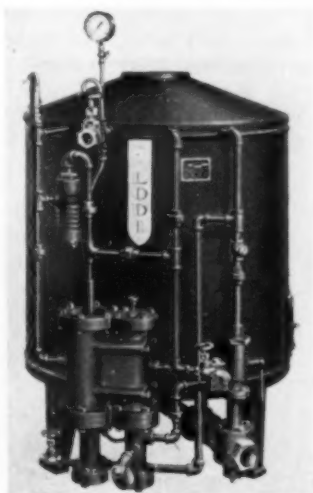
Automatic Steam Generator

SEVERAL new features in steam generation equipment are found in the new Lodi steam generator which has been developed and announced by Super Mold Corp., Lodi, Calif. Models are available in various sizes up to 70 hp. for pressures to 150 lb. They are available for operation with gas, oil or butane-propane gas burners. The generator is rapid in action, the 10 hp. model developing 150 lb. pressure from a cold start in less than 5 min. It has only three moving parts and is automatically controlled by mechanical devices which do not require electricity for their operation.

Wood-slat pallet



Automatic steam generator



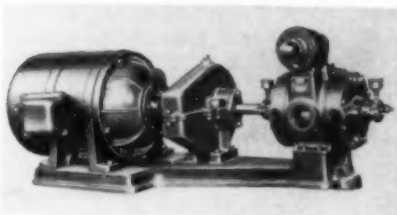
The boiler consists of a group of nested conical coils of continuous pipes, tested to 1,000 lb. pressure, so arranged with respect to the burner that a fire box and insulation are not required. A large amount of heat-transfer surface is provided and the flow of water through the coils, which at all times is under forced circulation, is such as to give a counterflow relation between the water and the hot products of combustion.

In addition to the boiler proper, the equipment includes a burner of the desired type, an automatic low-water fuel-shut-off, an automatic feed water pump, and a "jet-control" which automatically and without the use of thermostats or motor-driven pumps furnishes feed water in direct proportion to the amount drawn off as steam. The jet-control is said to assure steam of consistently uniform quality, regardless of varying load conditions. The entire generator is shipped as a unit, is light in weight and requires little space for its installation.

Steam-Jacketed Pumps

NEW DESIGN, said to be much simplified, is claimed for the steam-jacketed rotary pump recently added to the line manufactured by the Blackmer Pump Co., Grand Rapids, Mich. Several of these pumps have already been installed in war production plants for the handling of such materials as palm oil, tar, greases, and similar liquids which must be pumped or processed hot. The steam-jacketed heads are made of cast semi-steel, with

Steam jacketed pump



Magnetic log washer



CHEM
& MET

PROCESS
EQUIPMENT NEWS

threaded intake and exhaust steam ports and drain plugs, suitable for pressures up to 125 lb. The pumps are provided with sleeve bearings for grease lubrication, of heavy construction to eliminate shaft whip and distortion. Pumps for pressures above 100 lb. are furnished with anti-friction bearings. Packing glands are designed to simplify re-packing. Standard Blackmer pumps in capacities from 20 to 700 g.p.m., for pressures to 300 lb. are available with the new steam-jacketed head.

Magnetic Log Washer

FOR THE TREATMENT of fine abrasives and similar materials in the wet state, Stearns Magnetic Mfg. Co., Milwaukee, Wis., has introduced an improved device, described as a magnetic log washer. The machine consists of a single ribbon-type screw conveyor operating at 30-32 r.p.m. on a slope with adjustable frame supports over the magnetic field, the conveyor being driven by a gear-reduction motor through a variable-pitch-sheave V-belt drive. Material to be treated is fed into the washer trough, the tailings being discharged at the lower end and the concentrates at the top. The magnetic flux is controlled by rheostats for maximum flexibility in adapting the equipment to the material being treated. Various sizes of magnetic log washer are made, ranging upward from a 12 in. x 72 in. size particularly adapted for small production and laboratory use. This size has overall dimensions of 7½ ft. x 44 in. x 4½ ft. high. The machine operates on direct current up to 300 volts, or from a motor-generator set where direct current is not available.

Thermoplastic Lining

BOTH CONCRETE and steel can be used for tanks to contain corrosive liquids, according to the manufacturer, through the use of Amercoat, a plastic-base coating, which is manufactured by American Pipe & Construction Co., P. O. Box 3428, Terminal Annex, Los

Angeles, Calif. This coating, composed of thermoplastic resins, is being used as a lining for concrete tanks for the storage of petroleum products. It is claimed to adhere tightly to concrete surfaces and to be impervious, producing a smooth, inert surface which is plastic enough not to check, crack or fracture when subjected to vibration and moderate expansion and contraction. Acids, alkalis and a variety of other chemicals are said not to affect this material which is odorless, tasteless, and dielectric. The material is applied cold by brush or spray on metal or concrete without the use of special tools or equipment.

Flow Colorimeter

FOR IMMEDIATE and direct indication of the light transmission of a liquid flowing continuously, as well as for the continuous registration of concentration and turbidity of solutions in chemical processes, Photovolt Corp., 95 Madison Ave., New York, N. Y., has developed the new Lumetron continuous-flow colorimeter, Model 400-S. The principle of the instrument is similar to that of the usual types of photoelectric colorimeters. The light from an incandescent lamp passes through a color filter and through the liquid, then impinging upon a barrier-layer photocell, the current of which is registered by a sensitive indicating instrument. The liquid under test passes through a glass tube, rather than being contained in an absorption cell or test tube. Once calibrated by means of a solution of known concentration, the instrument indicates the concentration continuously, obviating the necessity for taking samples and analyzing them at regular intervals. A variety of filters are available for use, depending on the character of the material to be tested. The instrument operates from a light socket, employing a constant-voltage transformer to insure constant light output.

This company has also introduced an electronic timer which is, in effect, an adjustable timing relay with immediate automatic resetting, for timing

periods from 1/20 sec. on. The instrument is designed for single actuation as well as for sequence timing and recycling. It is employed to open or close an electrical circuit for a preset time interval. Its operating principle is similar to that of an hour glass which is comparable to a charged condenser, the discharge time of which can be controlled by adjustable resistors. During the discharge, amplifier tubes energize the relay, but when the discharge of the condenser is completed, the amplifier tubes become inoperative and the relay is de-energized. After completing the timing period, it does not take more than 1/60 sec. for the timer to be ready for the next operation. A series of these timers can be used to furnish a sequence of timed intervals by means of simple electrical connections. Individual timers are capable of carrying loads up to 1,200 watts, if non-inductive.

Copper-Saving Support

AN ACCOMPANYING ILLUSTRATION shows representatives of a new line of copper-saving supports for open wiring which have recently been put on the market by Delta-Star Electric Co., 2400 Block, Fulton St., Chicago, Ill. War requirements have dictated the need for methods to save time, material and man-power. As a consequence, open wiring is now being employed more extensively, following a recent interim amendment to the 1940 National Electrical Code which permits multiple circuits and the use of supports of this type up to 600 volts. Copper savings in excess of 50 percent, with equal or better voltage regulation and lower construction costs, are claimed to result from this practice.

Drum-Loading Trucks

EXTREME RUGGEDNESS, and ease of operation in the handling of heavy drums, barrels and kegs up to 1,000 lb. weight, are claimed for the new "Upsy Truck", a new addition to the line of pressed steel hand trucks manufactured by American Pulley Co., 4200

Wissahickon Ave., Philadelphia, Pa. A sliding hook on the center rail of the truck catches the top bead or chime of the drum, permitting the trucker to pull down on the handle, tilting the drum toward him. Nose prongs then slide under the bottom chime and as the handles are lowered to trucking position, the drum is lifted off the floor. The balance is such that the load is said to be easily handled. The truck may be equipped with semi-steel wheels or "floor-saver" wheels, with roller bearings optional at additional cost.

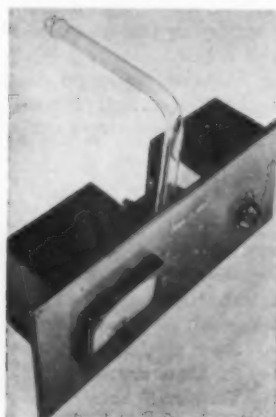
Rotary Air Motor

ESPECIALLY for applications where explosion-proof equipment is essential, as in munitions plants, Gast Mfg. Corp., Benton Harbor, Mich., is building an improved rotary air motor which employs no reciprocating parts or springs, has automatic take-up for wear, is positive starting in any position, and is decidedly compact in proportion to the power developed. The motor cannot burn out and is available in sizes ranging from 1/20 to 1 hp. These motors are equipped with ball bearings and self-adjusting shaft seals instead of packing.

Flow Transmitter

STYLE H is the name given to a new low-pressure flow transmitter for use with the company's standard electric meter units, which has been announced by the Cochrane Corp., 17th and Allegheny Aves., Philadelphia, Pa. The transmitter is designed specifically for the measurement of low static-pressure gases where low differential, and resultant low permanent pressure loss, are of prime importance. Differential pressure created by flow through an orifice is applied to the opposite sides of an oil-sealed bell. The weight of the bell is compensated by a displacer floating in a mercury reservoir. Movement of the bell resulting from a differential pressure applied to it results in a corresponding movement of a magnetic core in a divided trans-

Flow-type colorimeter



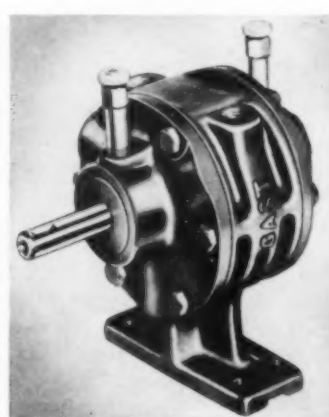
Open wiring supports

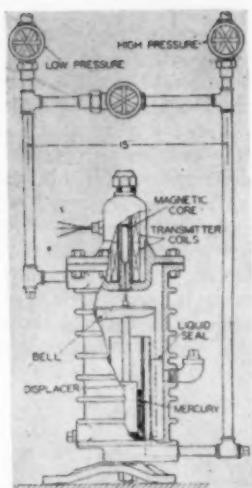


Drum-carrying truck

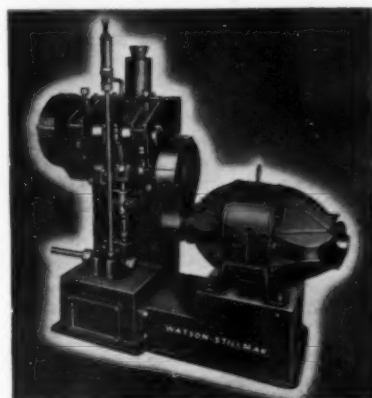


Explosion-proof air motor





Low-pressure flow transmitter



High-pressure starting pump

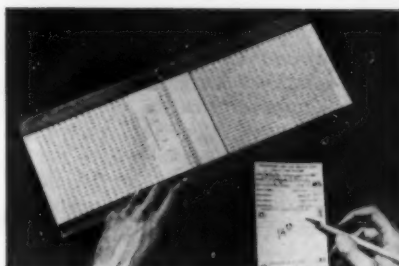
mitter coil of the induction balance type. The coil is connected by means of three wires with the receiving station, which corrects to uniform scale indication by means of the type of calibrated cam used in this company's flow recorders. The transmitter is designed for differentials ranging from 2 to 10 in. of water. The bell casing is designed for a maximum pressure of 75 lb. per sq. in.

High Pressure Pumps

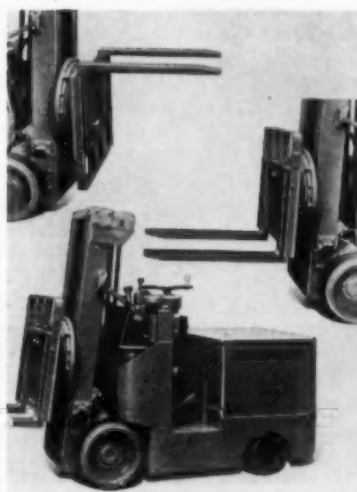
FOR HIGH-PRESSURE service, up to 4,000 lb. per sq. in., Watson-Stillman Co., Roselle, N. J., has introduced a new high-pressure starting pump designed for the starting of diesel engines, and for the testing or operation of hydraulic presses. The pump is a two-plunger vertical unit with $\frac{3}{4}$ -in. diameter plungers having a $1\frac{1}{2}$ -in. stroke. Powered by a 2-hp. motor, the pump delivers 130 cu. in. of oil or water at a pump speed of 100 r.p.m.

Pay Roll Calculator

A SIMPLE DEVICE for the calculation of pay rolls and job costs in a fraction of the time usually required is available from the Berger-Bricker Co., 433 South Spring St., Los Angeles,



Pay roll calculator



Rotating-fork truck

Calif. The device includes all hourly rates of pay from 50 cents to \$1.75, with a half-cent spread between rates. It covers all time periods up to 104 hours, with divisions of $\frac{1}{10}$ hour. It consists of lacquered wood, and is designed to fit into a desk drawer.

Electric Trucks

ROTATING FORKS on a rotating base capable of making a complete revolution are now being supplied by the Elwell-Parker Electric Co., Cleveland, Ohio, on the company's center control trucks, Type F-23T. However, should the work call for only a partial revolution, as for body dumping into gondola cars, the base can be provided with stops to limit the swing to any angle up to 180 deg. At the top position the forks carry either suspended or supported loads, the latter for extra high tiering. When locked in place at the bottom, they handle pallets or low skids without adjustment. For handling rolled paper, the forks are interchangeable with rotating aprons to pick up or deliver the roll on the end or side. The truck is electric powered, handling up to 4,000 lb. with a telescoping tiering height to 140 in.

Another new development announced by this company is a combination crane and load-carrying truck which performs the several functions of load carrier, crane and tractor. The truck has an unobstructed platform area of 84x40 in., with a rated capacity of

6,000 lb., the crane being capable of handling up to 2,000 lb. at 42 in. on the boom. This unit also is electric powered.

Equipment Briefs

MINE SAFETY APPLIANCES Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa., announces the redesign of the Comfo Dust Respirator to employ a filter case of black plastic and thus save metal for war production. The new respirator is said to be of better appearance and to offer less resistance to air flow, while at the same time it improves sidewise and downward vision. The new cases are non-conducting electrically and unaffected by perspiration.

TYPICAL of the many efforts now being made to avoid the use of critical materials is the new line of Victory Lockers made from wood and produced by Curtis Co., Inc., Clinton, Iowa. These lockers require no critical material, being made of plywood panels dovetailed into Ponderosa pine framework. The lockers are shipped knocked down and are easily and quickly assembled using a newly developed hardwood dovetail lock which fastens the various panels rigidly together.

ANNOUNCEMENT is made by the Acme Electric & Mfg. Co., Cuba, N. Y., of the availability of this company's new Model F-100-25 lamp ballast for use with four 100-watt fluorescent lamps. The new ballast is stated to provide equalized and balanced secondary voltage to each lamp and when starters and switches are in good condition, to assure all four lamps of the unit lighting at the same time without delay or flashing.

TO DETECT the presence of water in storage tanks of non-conducting liquids such as hydrocarbons, including petroleum products, Photoswitch, Inc., 21 Chestnut St., Cambridge, Mass., has developed an electronic water detector lock designated as Type P-15NH. The device consists of a controller and a probe fitting, the latter mounted in a standard pipe fitting on the top of the tank, with the probe rod projecting down through the tank to the level at which water seepage is to be detected, usually 3 in. from the bottom of the tank. When the probe rod contacts water, the electrical circuit is completed through the water, and the control element operates to turn off pumping equipment and to actuate an alarm.

TO INSURE PRIVACY in multi-station intercommunication systems, the Talk-A-Phone Mfg. Co., 1219 West Van Buren St., Chicago, Ill., has developed the All-Master Super Selective intercommunicating system which makes it impossible for third parties to listen

in while two people are speaking on the system. For additional privacy the use of an earphone is optional. The systems are available with various numbers of stations from 2 to 80 or even more.

ESPECIALLY for use in producing ultra-violet light at high efficiency and high intensity for the identification of solid inorganic substances by fluorescence, Pfaltz and Bauer, Inc., Empire State Building, New York, N. Y., are offering a new fused-quartz ultra-violet generator, said to be particularly suited to this purpose. The method may also be used for the detection of impurities.

"Octopus" Ventilator

FOR USE where a single exhaustor or ventilator equipped with multiple outlets can be employed to take care of several working areas, Chelsea Fan & Blower Co., 1206 Grove St., Irvington, N. J., has developed the "Octopus" exhaustor and ventilator which can be placed or hung in any convenient location between the working area and the open air. The unit is connected by means of flexible metal hoses to the several areas to be ventilated. A newly developed blower wheel designed particularly for this type of machine is used, together with a heavy-duty ball-bearing motor equipped with overload protection. The exhaustor can easily be converted into a fresh air ventilator by changing the position of the tube adapter which is part of the equipment. From one to six of the nozzles can be used as desired.

More recently, following demand for a smaller portable unit, the company has announced the "Octopus Jr." This model handles 2,000 c.f.m. and can be equipped with either three 4-in. nozzles or four 3-in. nozzles.

Fire Fighting Equipment

AMONG the new developments announced by American-LaFrance-Foamite Corp., Elmira, N. Y., is Alco-foam powder, a single-powder foam producing chemical for the extinguishment of alcohol fires. This powder, used in any single-powder generator, combines with the stream of water flowing through the generator to produce a smothering blanket capable of extinguishing flames in alcohol, ketones, esters, ethers, and many other such flammable liquids. It is said also to be effective on petroleum fires. The new foam may be applied either through fixed connections on a storage tank, or directed through a hose and nozzle. It is stated to coat and insulate any burning surface, liquid or solid, vertical or horizontal. Approval has been granted by both Underwriters' and Factory Mutual Laboratories.

This company has also announced a new 100-lb. carbon dioxide engine said

to be the only engine of this capacity approved by both Underwriters' and Factory Mutual Laboratories for use on both electrical and oil fires. The engine is equipped with an anti-static horn to protect the operator from static charges, and is designed for perfect balance at wheeling height and for ready handling. A third swivel wheel is provided for easy maneuvering.

Enameled Reflector

FOR GENERAL LIGHTING of high and medium bay areas in industrial plants, Westinghouse Electric & Mfg. Co., Lighting Div., Edgewater Park, Cleveland, Ohio, has introduced a new porcelain enameled line of high bay reflectors. The new reflectors are designed for use with either incandescent or high intensity mercury lamps, and are supplied either in a two-piece quick detachable construction, or a one-piece type for conduit or outlet box mounting. The multiple-coat porcelain enameled reflecting surface is said to be easily cleaned and to have a reflectivity of 80 percent.

Alternating Current Welder

TO INCREASE the efficiency and step up the speed of the welding of heavier and thicker metals, Allis-Chalmers Mfg. Co., Milwaukee, Wis., has developed a new alternating current welder which is said to produce exactly the proper voltage for every current setting. An entirely new principle in welder design is employed, the trans-

former and reactor being built as an integral unit with the reactor coils surrounding the air gap so as to eliminate magnetic leakage. The arrangement provides continuous control from 35 to 250 amp., a safe, high, open-circuit voltage at low current, and a lower open-circuit voltage at higher current, where efficiency and power factor are important. The new welder is built without plugs, taps, or switches of any kind, the manual control at the top of the unit covering the entire welding range with less than a dozen turns of the control handle. These new welders range in capacity from 200 to 600 amp.

All-Position Electrode

AIR REDUCTION SALES Co., 60 East 42d St., New York, N. Y., has announced a new welding electrode designed specifically for all-position welding of mild steel with alternating current welders. Designated as Aircro No. 230, the electrode is available in 1/8- and 5/32-in. sizes, complying with all requirements of the American Welding Society Classification E-6011, and other specifications. It is claimed that the metal deposited from this electrode is fully comparable to that of the best direct-current, reverse-polarity, all-position electrodes. Assuring a good ultimate tensile strength and elongation, the new electrode is said to permit the average operator to secure good fusion and complete penetration without difficulty, and to produce a finished weld deposit which is smooth and of uniform surface contour.

"Octopus Jr." ventilator and exhaustor



High bay reflector



Alternating current welder



100-lb. carbon dioxide engine



CASH STANDARD *Streamlined* REDUCING VALVES

TYPE 1000
PRESSURE

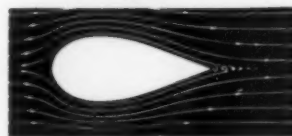
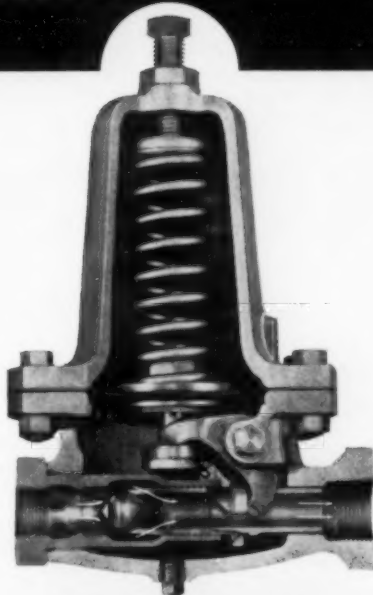
THEY'LL SEE YOU THROUGH
WITH *Non-Stop Production . . .*

● Smooth, speedy, non-stop production is a vital thing today. It's a great advantage to have the dependability of operation—the smooth, even flow of steam, air, or oil—the better pressure control and greater capacity obtainable with the "1000" Valve. The Streamlined flow pattern you see at the right pictures for you the kind of valve action you get that is an important factor in keeping things going on your production front. Years after they have been installed, "1000" Valves perform so that you continue to realize all of the twelve benefits listed below. The "1000" is known as the "NO TROUBLE" Valve.

POINTS THAT COUNT BIG IN YOUR FAVOR

You get all Twelve . . .

- | | |
|---|--|
| 1 Maximum Capacity when needed most | 7 Speedier Production Results |
| 2 Accurate Pressure Control under toughest working conditions | 8 Elimination of failures |
| 3 Trouble-free Service | 9 Constant Delivery Pressure |
| 4 Smooth Operation | 10 Cost Saving Operation |
| 5 Tight Closure | 11 No Spoilage |
| 6 Accurate Regulation | 12 Practically zero in maintenance costs |



HERE'S THE "1000" FLOW PATTERN
The Streamlined form of the inner valve eliminates turbulence. It produces the flow pattern shown above which makes for maximum capacity when it is needed most and permits accurate pressure control under toughest working conditions.



You can find out full details on all of the Type 1000 benefits by reading Bulletin "1000"—send for it!

CASH STANDARD
CONTROLS..
VALVES

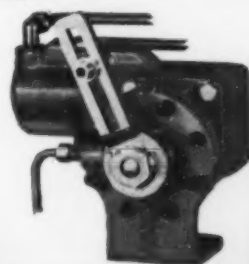
New CASH STANDARD Remote HYDRAULIC Control

Transmits oscillating motion without mechanical linkage



TYPE 550 SENDER

● Primarily used by aircraft manufacturers and aeronautical laboratories on engine test cells for controlling throttle position and mixture—this Type 550 Remote Hydraulic Control may fit your needs too. It is good for use where you desire to control apparatus remotely—without mechanical linkage. To operate, depress button in control lever with thumb. This releases the automatic brake. Move control lever to any desired position; release button, and control is automatically locked in that position, where it will remain indefinitely. The unit — A Type 550 Sender (above) and Type 550 Receiver (below), has positive hydraulic power in both directions — no springs, no cups on pistons. It transmits the total force applied to the control lever. There is no lost motion in either direction. The lever of the Receiver moves 90 degrees. It can be indexed to any position. For easy mounting, the bracket of the Receiver can be indexed to four positions. The Receiver can be installed above or below the Sender.



TYPE 550 RECEIVER

Write for Data

A. W. CASH COMPANY

Electrolytic Chlorine and Caustic Soda

A TYPICAL modern electrolytic chlorine-caustic soda plant is shown in the accompanying diagrammatic flowsheet. The photographs are from Hooker Electrochemical Co. and Michigan Alkali Co.

Rock salt is dissolved (some plants obtain brine from wells) and the usual impurities, calcium and magnesium sulphates and chlorides, are precipitated from the brine by addition of soda ash and caustic soda. The brine is clarified by settling and filtration. To increase the salt content to a practical maximum, the brine is heated and saturated with purified re-cycled salt before going to the cells.

Supply of direct current is obtained from high voltage, alternating current by step-down transformers, and mercury-arc rectifiers. For a circuit of 200 Hooker type S cells, 7,500 amperes at about 700 volts is required.

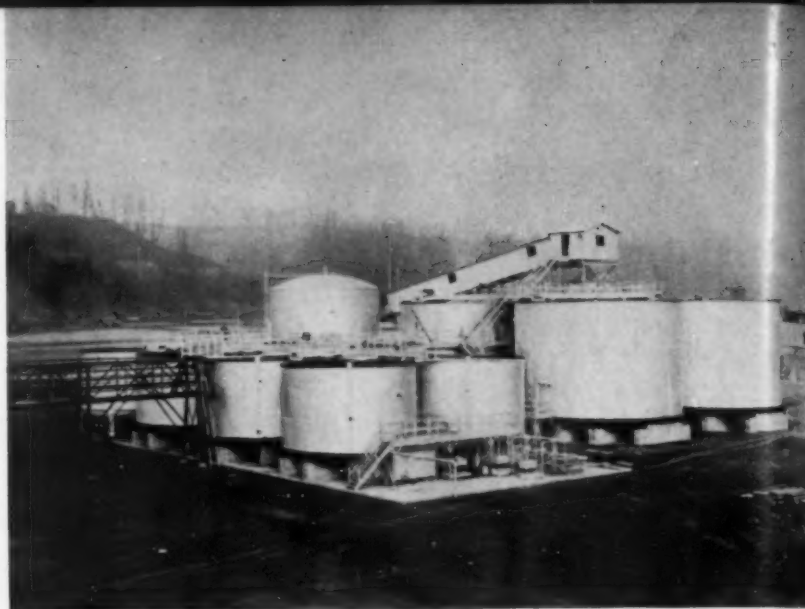
Electrolysis results in the formation of chlorine and hydrogen gases, and caustic soda solution containing 11.3 weight percent NaOH and 15 weight percent NaCl. The gases leave the cells saturated with water vapor. The three products are withdrawn separately and processed in different departments. Hydrogen cell gas is scrubbed with water sprays to cool it and to remove any traces of salt or caustic. It is then compressed for supplying various processes. Chlorine cell gas is cooled and then dried with sulphuric acid. The dried gas is compressed to 25-60 lb. per sq.in. It may then be used for various processes or sent to the refrigerated liquefying coils. The liquid chlorine is then transferred to tank cars or to storage.

The cell liquor is evaporated until the NaOH content is 50 percent by weight. Salt crystallizes out of the liquor as the NaOH content is increased, and is removed by continuous settling. Finally, it is washed free of caustic for re-cycling in the process.

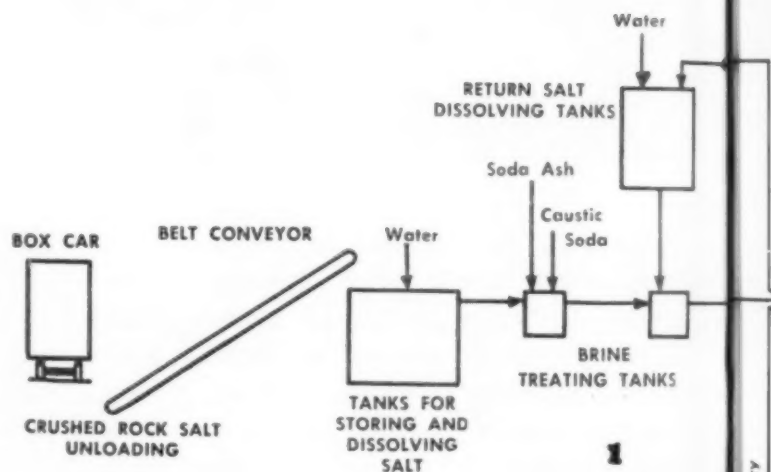
Evaporation of cell liquor in large plants is done in triple effect. Modern practice is to circulate the liquor rapidly in each effect through an external heater. Salt is removed continuously from the bottom cones of the first and second-effect pans. Salt separators continuously decant liquor from the salt.

Additional salt is removed from 50 percent caustic by cooling and settling. Standard 50 percent solution containing 1.1 percent salt is shipped as such, or may be evaporated in single-effect pans to 73 percent liquid caustic. Solid caustic is produced by evaporation and fusion of 73 percent material. Fused caustic, much of which is flaked, is packed in drums.

For further information on Hooker cell plants see Chem. & Met. vol. 45, pages 296-299, and 354-358.



1 Brine system: Salt unloading conveyor, salt storage and dissolving tanks, brine treating, settling, filtering and storage

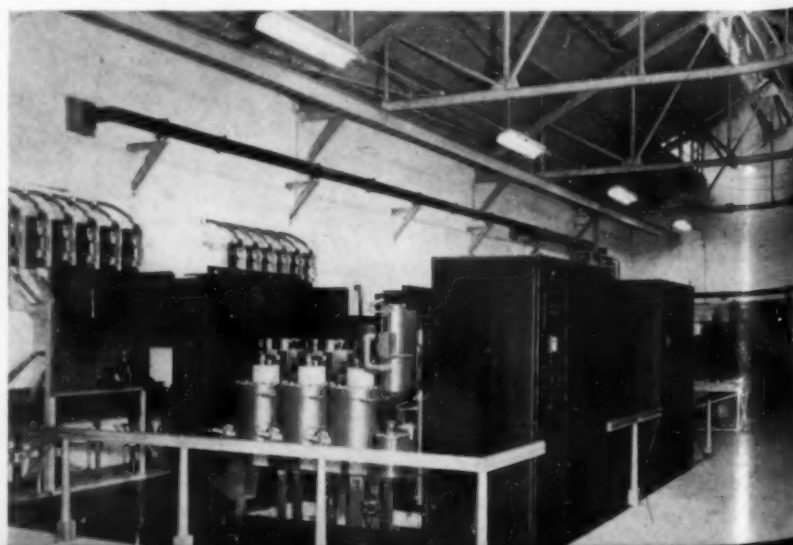


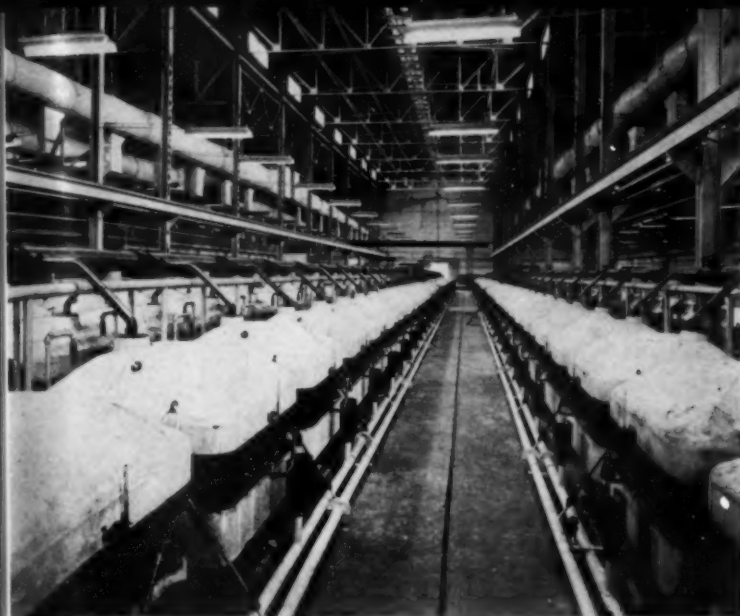
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ENGINEERING

December, 1942

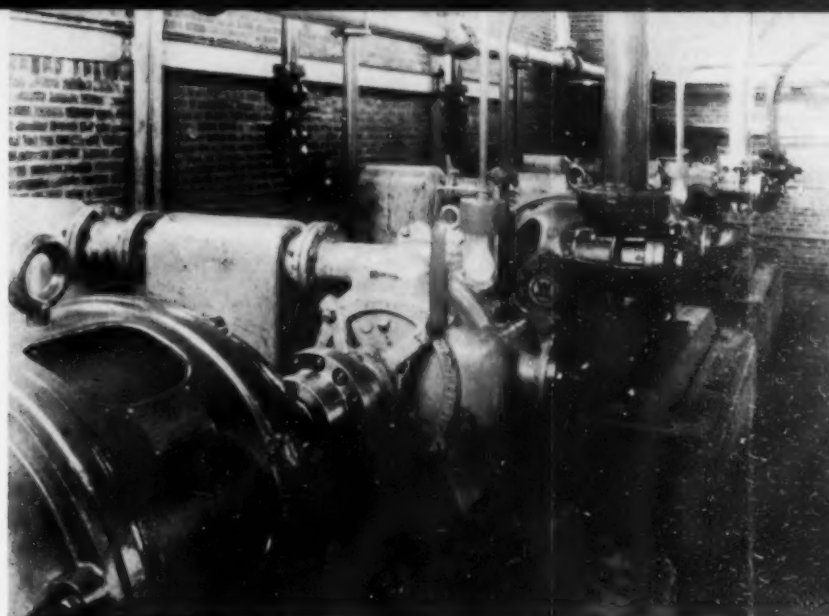
PAGES 114-12 to 117-12

2 Rectifier installation: Mercury-arc rectifiers for supplying direct current for a large installation of cells

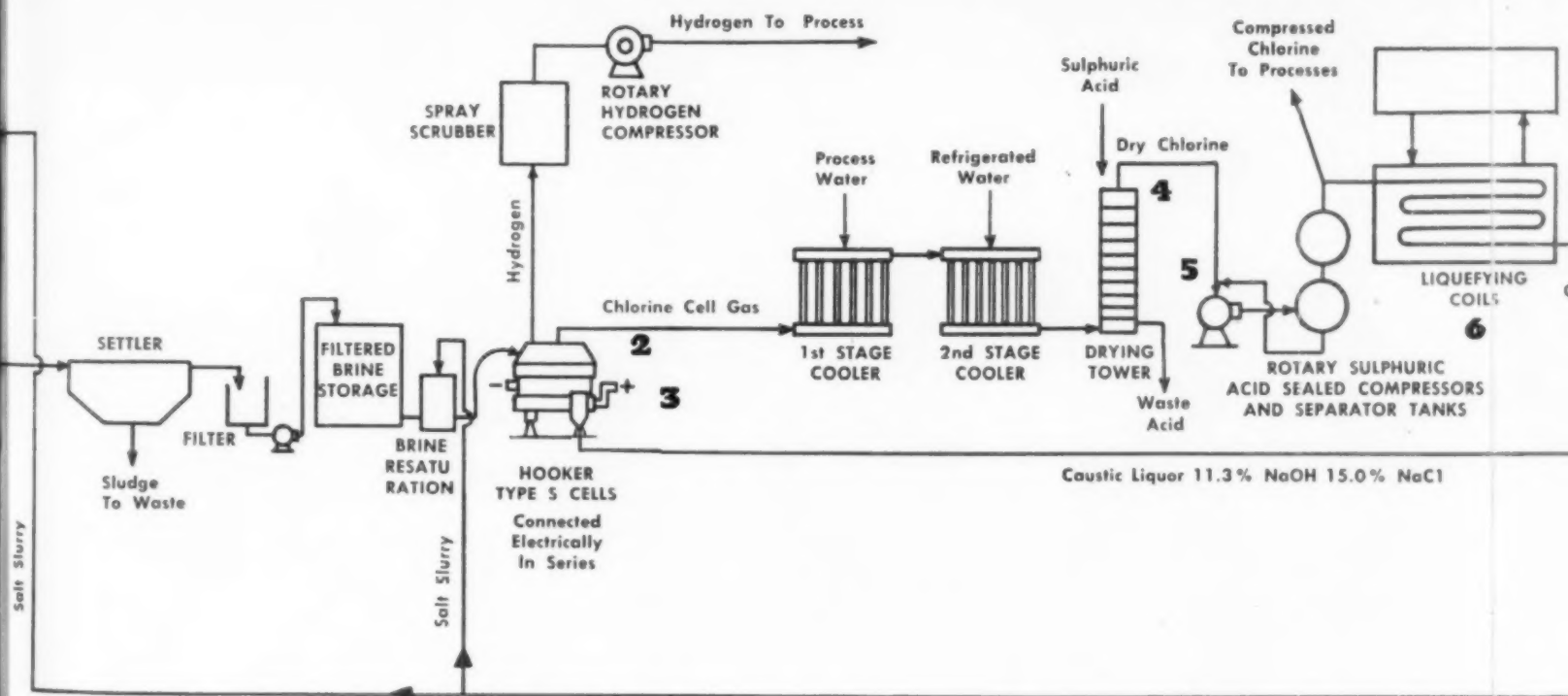




3 Hooker type S cell room: Cells connected electrically in series convert sodium chloride brine to chlorine, hydrogen and caustic soda

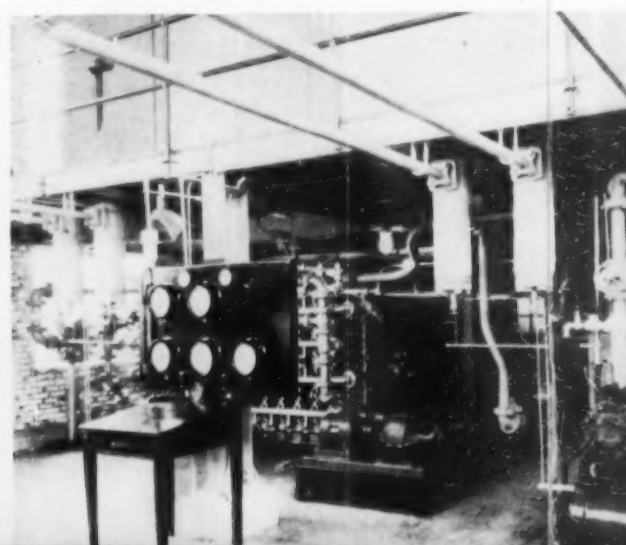


5 Rotary sulphuric acid sealed compressors: Chlorine gas, after cooling and drying is compressed by means of rotary sulphuric acid sealed compressors



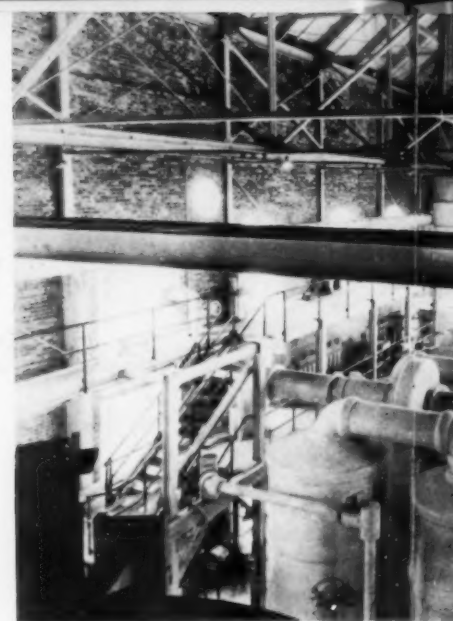
4 Chlorine drying towers: After cooling in the first and second stages, the wet chlorine gas is dried by sulphuric acid in ceramic towers shown here

6 Refrigeration machinery: The compressed dry chlorine is refrigeration machinery shown for storage or shipment

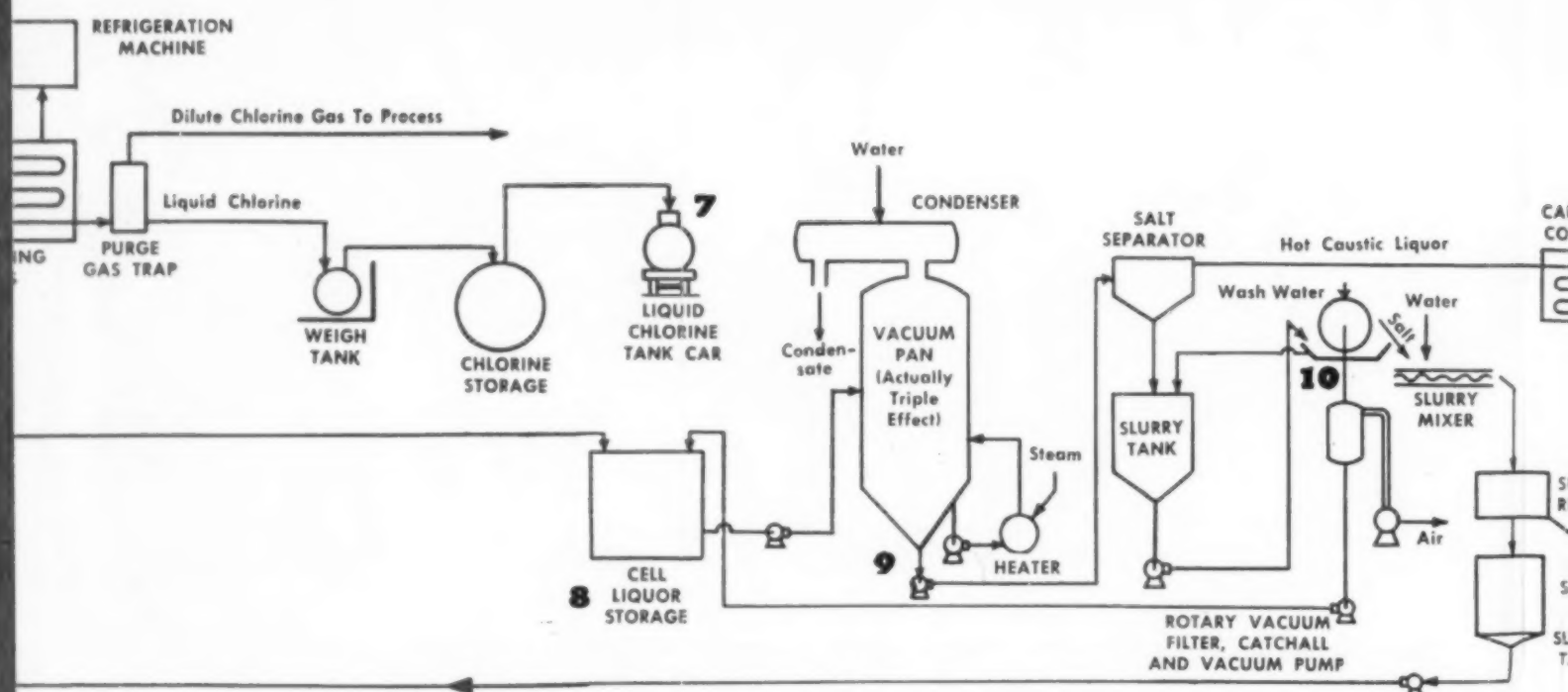




7 Liquid chlorine tank car: Liquid chlorine as required is loaded into insulated tank cars for shipment to all parts of the country



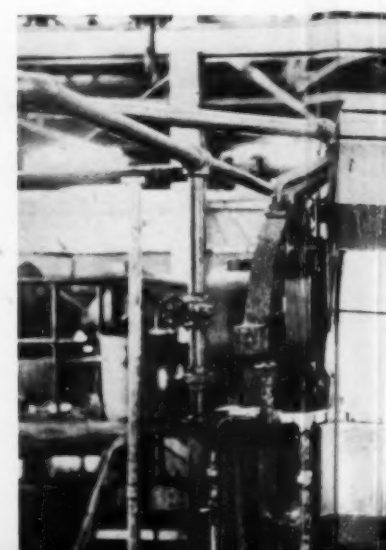
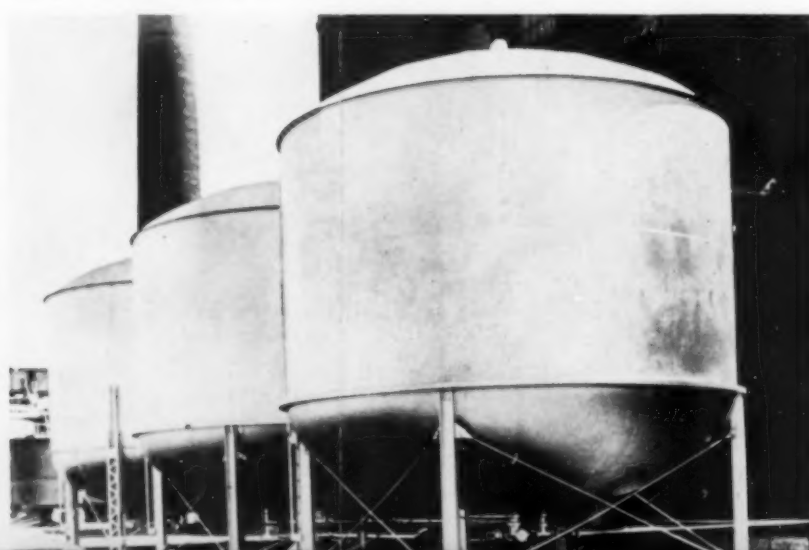
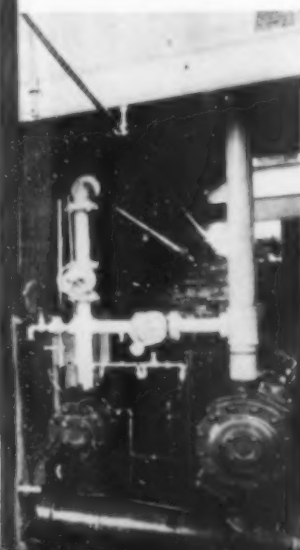
9 Triple-effect vacuum pans: Cell liquor is removed continuously as it crystallizes from

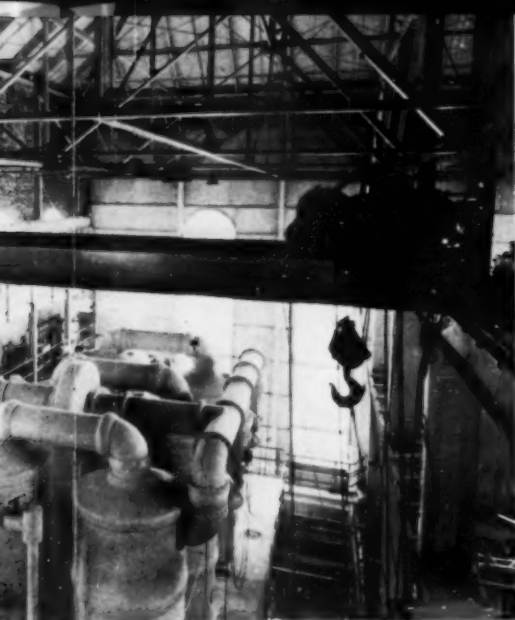


Chlorine is liquefied in the

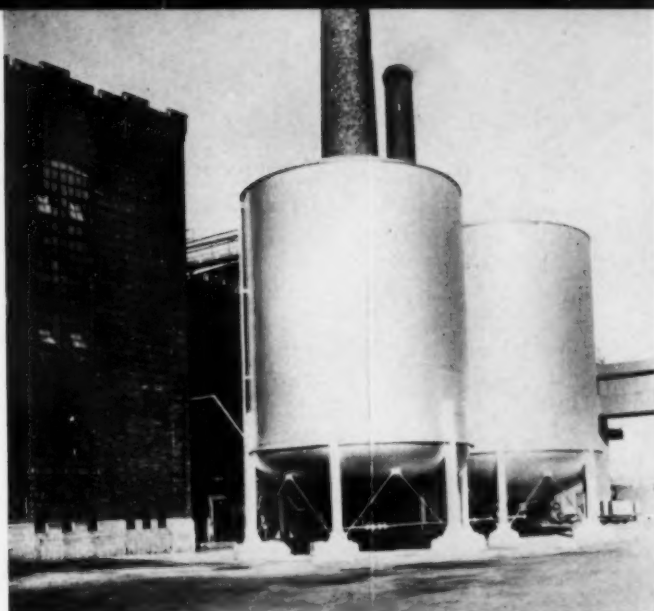
8 Cell liquor storage: Liquor from cells (salt and caustic in solution) is stored in order to provide surge between cells and evaporators

10 Rotary vacuum salt filter: Salt crystals are removed from caustic liquor by decantation and

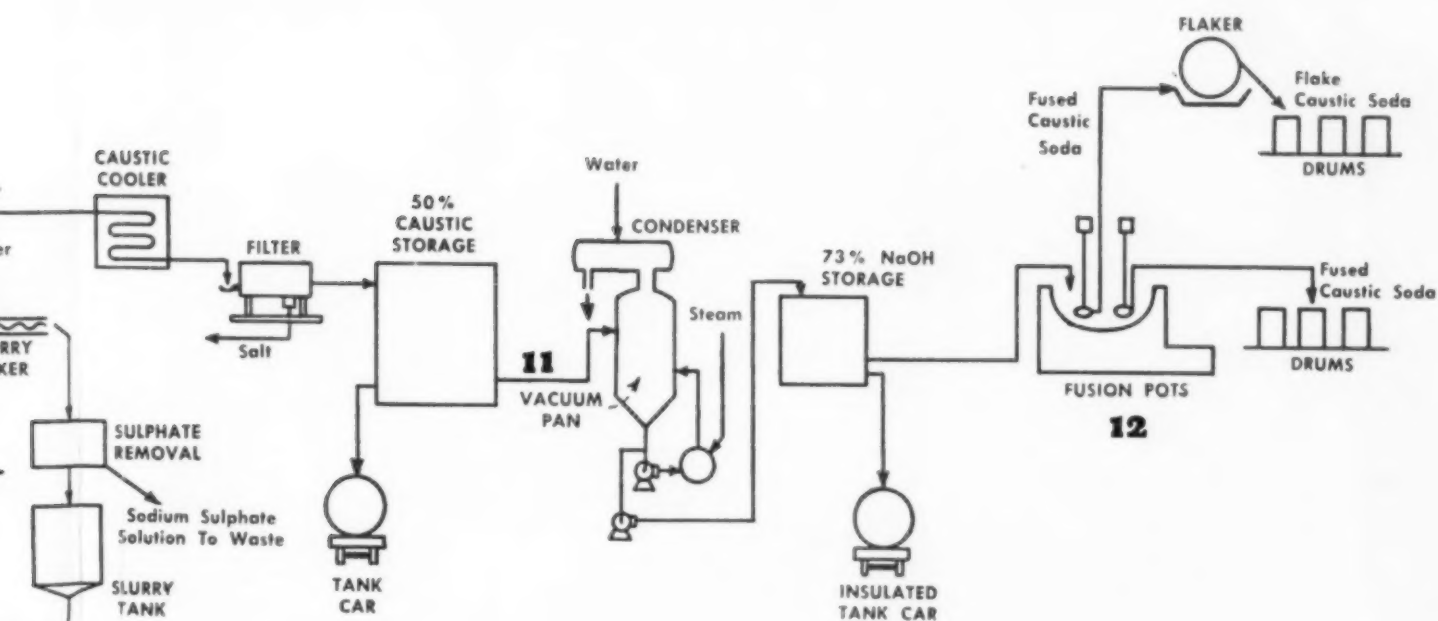




all liquor is evaporated in vacuum pans. Salt crystallizes from the caustic liquor

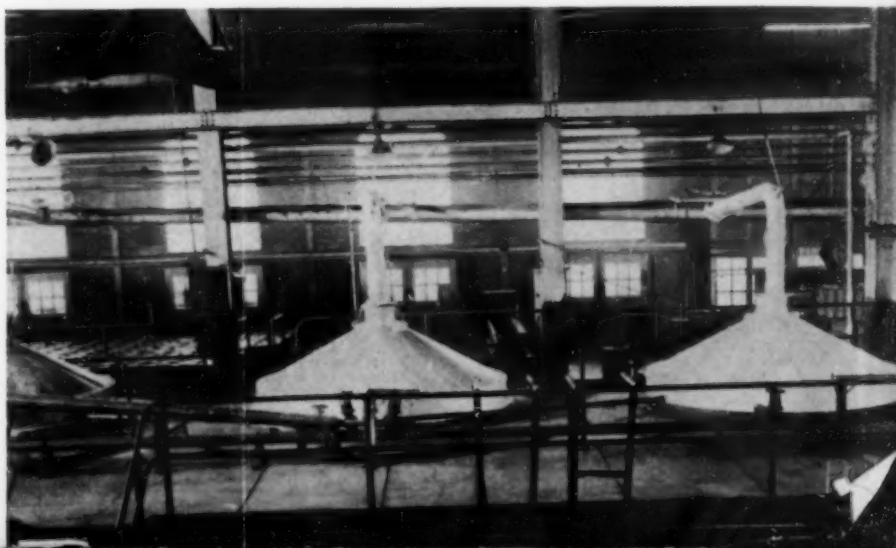
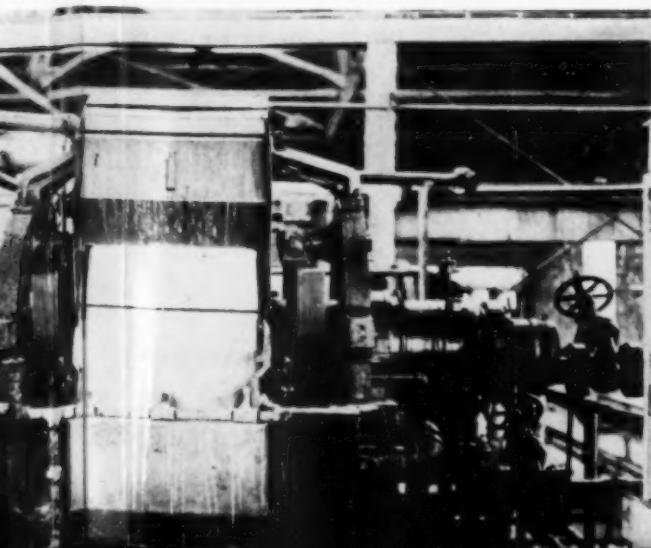


11 Caustic liquor storage tanks: After cooling, settling, and filtration, 50% NaOH liquor is stored in steel tanks

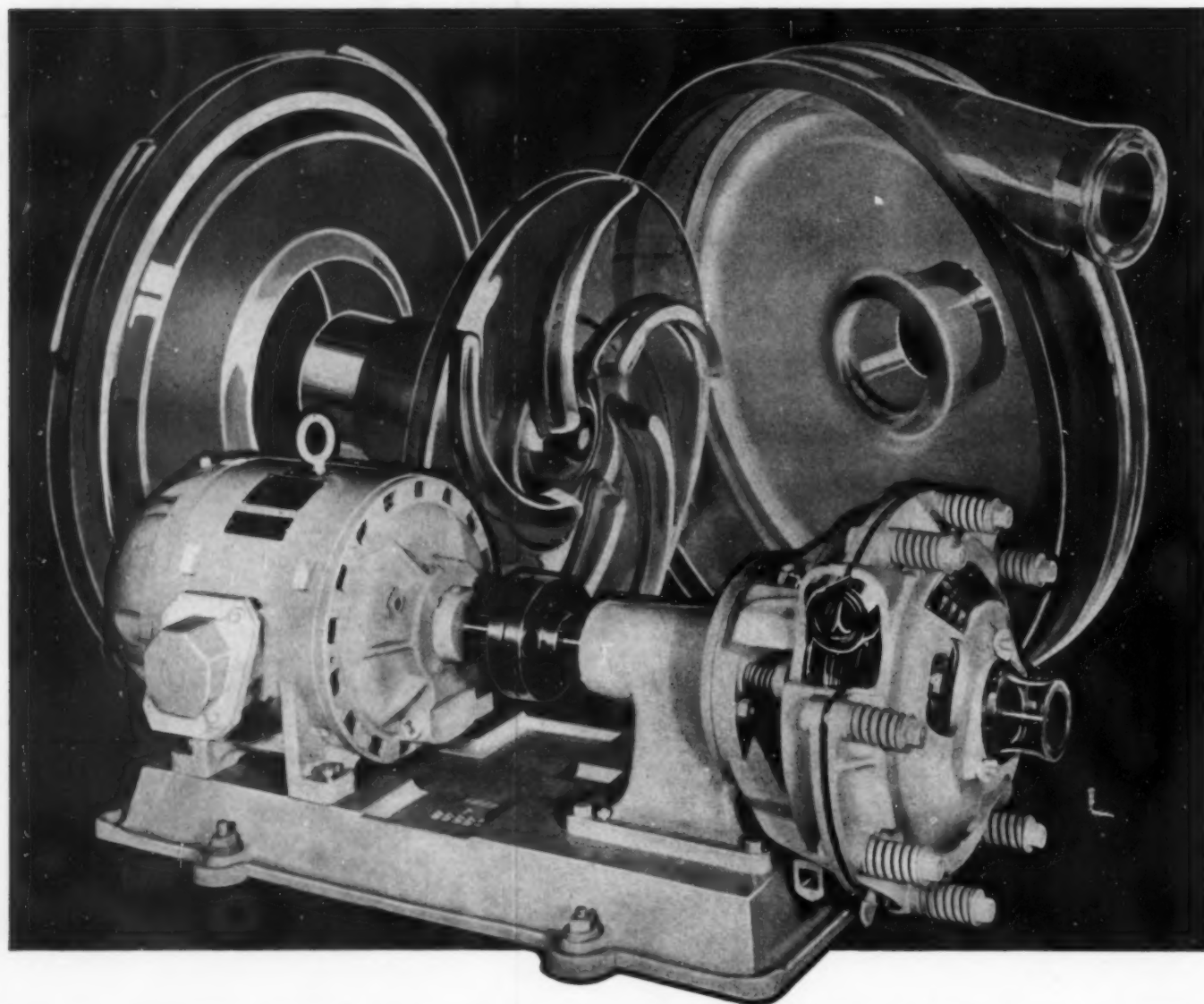


filter: Salt crystals from vacuum pans are partially separated by decantation and are washed practically free of caustic

12 Caustic fusion pots: Liquid caustic soda of 50-73% NaOH is dried and fused by heating in direct-fired cast iron pots



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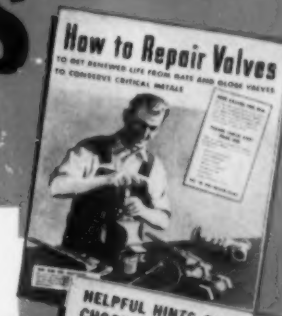
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*For further details,
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Technical, Industrial, Personal

CHEMICAL ADVISORY COMMITTEE NOW FUNCTIONING

The Chemical Facilities Industry Advisory Committee held its first meeting in Washington on Nov. 17. It will serve as the representative of the Chemical Industry in advising the Chemical Division on problems of chemical manufacture. According to WPB, a primary consideration will be "the concentration of present facilities wherever possible in an attempt to conserve money, materials, manpower and time." The Committee has been asked for information on present facilities which might be adapted for conversion to the rapid manufacture of a number of chemicals. These include ethyl cellulose, alcohol, dibutyl amine, diethyl amine, ethyl aniline, furfural, mannitol, sorbitol, phenol, thiokol, triethyl phosphate, triethyl phosphate, acetanilid, aluminum chloride, calcium carbide, calcium hydrochloride, acrylonitrile, silica gel, and others.

Personnel of the committee includes the following: Arthur G. Boylston, Mallinckrodt Chemical Works; Frederick Dehls, Benzol Products Co.; D. S. Dinsmoor, Monsanto Chemical Co.; E. H. Killheffer, E. I. du Pont de Nemours & Co., Inc.; W. T. Haebler, Van Ameringen-Haebler, Inc.; F. H. Lidbury, Oldbury Electrochemical Co.; H. B. McClure, Carbide & Carbon Chemicals Corp.; Thos. H. Roberts, Arnold, Hoffman & Co.; H. L. Simons, Harold L. Simons, Inc.; S. J. Spitz, Newport Industries, Inc.; Robert Trubek, Trubek Laboratories, Inc.; M. C. Whitaker, American Cyanamid Co.; F. H. Zinsser, Zinsser & Co.

Jas. H. Lawson, Chief, Facilities Machinery & Projects Section, Chemical Division, is government presiding officer of the committee. The executive committee consists of Dr. Killheffer, chairman, and Messrs. Dehls and Spitz.

CONTROLLED MATERIAL PLAN AFFECTS CHEMICALS

Although the application of the Controlled Material Plan, as it will be put into effect in the first quarter of next year, applies only to a few metals, it will have an important bearing on the chemical industry. In the first place this may be directly felt in the case of chemicals made from the specified metals. Metal requirements for maintenance and repair of chemical plants also will be affected as will metal requirements for new plant construction.

The Chemicals Division of WPB is making a detailed survey of metal requirements for repair and maintenance in a selected group of plants in order that metal for chemical industry repair and maintenance may be set aside when CMP goes into effect.

WPB field offices will soon have booklets of detailed instructions for filling out the Bill of Materials required by the CMP. Prime consumers of controlled materials—aluminum, copper, steel—must submit their re-

quirements for the second quarter of 1943 in the form of Bills of Materials to the Claimant Agency (Army, Navy, Maritime Commission, Civilian Supply, etc.) from which they will receive their allotments. Secondary consumers must file their Bills of Materials with their customers who, in turn, are responsible for their accuracy and who will include them in their own Bills submitted to the Claimant Agencies. Most products from every producer will not require a Bill of Materials. No firm need prepare a Bill of Material unless specifically instructed to do so by a Claimant Agency, a WPB Industry Division or by another company to which it sells its product and which has been instructed to furnish a Bill of Material.

NATIONAL SAFETY COUNCIL ELECTS OFFICERS

Sectional officers of the National Safety Council have been elected for 1943. The Chemical Section will be under the direction of the following:

Executive Committee—Major R. C. Stratton, CWS, Office of the Chief of Ordnance, Safety & Security Branch, Chicago, general chairman; James J. Duggan, Carbide & Carbon Chemicals Corp., South Charleston, vice-chairman in charge of program; and H. F. Gilbert, American Cyanamid Co., New York, secretary.

News Letter Committee—Allen L. Cobb, Eastman Kodak Co., Rochester, chairman; E. F. King, Lever Brothers Co., Cambridge; and W. C. Shaw, Procter & Gamble Defense Corp., Wolf Creek Ordnance Plant, Milan, Tenn.

Engineering Committee—D. O. Mason, General Chemical Co., New York, chairman; Dr. E. G. Meiter, Employers Mutuals, Milwaukee; and E. J. Sait, Canadian Industries Ltd., Montreal.

Data and Instruction Card Committee—R. S. Mackie, General Electric Co., Cleveland, chairman; R. C. Hamilton, The Solvay Process Co., Syracuse; and John W. Sawyer, Procter & Gamble Defense Corp., Gulf Ordnance Plant, Aberdeen, Miss.

Health Committee—S. W. Gurney, Liberty Mutual Insurance Co., Boston, chairman; Dr. Leonard Greenburg, N. Y. State Department of Labor, New York; S. M. MacCutcheon, Dow Chemical Co., Midland; and Dr. H. H. Schrenk, U. S. Bureau of Mines, Pittsburgh.

Membership Committee—C. E. Sevens, Monsanto Chemical Co., Boston, chairman; W. L. Hammersley, Electric Storage Battery Co., Philadelphia; and James H. Hayes, National Fireworks, Inc., West Hanover, Mass.

Poster Committee—M. R. Budd, Hercules Powder Co., Wilmington, chairman; and P. C. Lamb, Lever Brothers Co., Edgewater.

Statistics and Contest Committee—M. A. Snell, Hartford Accident & Indemnity Co., Hartford, chairman; and E. J. Riederer, Atlas Powder Co., Wilmington.

CHEM & MET NEWS

Advisory Committee—F. W. Dennis, Hooker Electrochemical Co., Niagara Falls; R. O. Keefer, Aluminum Co. of America, Pittsburgh; R. L. Rogers, Jr., Tennessee Eastman Corp., Kingsport; H. L. Miner, E. I. du Pont de Nemours & Co., Wilmington; John Roach, Deputy Commissioner of Labor, Trenton; John S. Shaw, Hercules Powder Co., Wilmington; A. L. Watson, Koppers United Co., Pittsburgh; and S. E. Whiting, Liberty Mutual Insurance Co., Boston.

BLAW-KNOX CONSTRUCTS PLANTS FOR SYNTHETIC RUBBER

The Defense Plant Corp., on the recommendation of the four leading rubber companies, has selected the Blaw-Knox Co. to prepare the fundamental engineering designs for the copolymerization plants for the entire synthetic rubber program.

The Blaw-Knox Co. has been working on the engineering design for several months and through a subsidiary, Blaw-Knox Construction Co., is engaged in the engineering and construction of six plants for the manufacture of synthetic rubber from butadiene and styrene.

Four of the plants are completely new installations, while two are additions to plants previously built by the company, and already in operation. The buildings are being erected by various contractors and Blaw-Knox will install the equipment in all the plants.

The largest of the new plants is an installation for the United States Rubber Co. Others are two plants for Firestone Tire and Rubber Co., and one for B. F. Goodrich Co. The two plants being enlarged are having second units installed. These are a plant for Firestone, and another for United States Rubber. The first units at Firestone and United States Rubber are now in operation.

MALIN HEADS OPA CHEMICALS AND DRUGS BRANCH

Patrick Murphy Malin, former associate director of the Export-Import Price Control Office of OPA has been appointed Price Executive of OPA's Chemicals and Drugs Price Branch. Mr. Malin succeeds R. Gorman Phelps who has resigned to return to private industry. From 1930-1940, Mr. Malin was in the Economics Department of Swarthmore University. Appointed as Mr. Malin's right hand man was Joseph D. Coppock, until recently a special assistant to William Batt.

News from Washington

WASHINGTON NEWS BUREAU, MCGRAW-HILL PUBLISHING CO.

OPENING of a big scale second front in North Africa and the almost certain spread of an all-out shooting offensive into Europe next year inexorably will dictate the course of the war production program from now on. To some extent, this means even less stability in war demands—not so much in the total demands perhaps as in the components. The shifting needs of the battlefield in action are more sudden and more imperative than the changing requirements of preparation.

Against this backdrop the stage was being set in early December for the next major struggle in the administration of the war program—scheduling vs. allocations, with the leading contenders being the two “titans” infused into the WPB superstructure in the September revolution, Charles E. Wilson and Ferdinand Eberstadt.

Essentially, this is a chicken-or-the-egg-first problem: Shall Mr. Wilson’s detailed production schedules be drawn up for Mr. Eberstadt’s guidance in distributing materials or shall Mr. Eberstadt allocate lumps of materials for Mr. Wilson to break down into output schedules? Of course, continuing the chicken-and-egg analogy, scheduling and allocation are complimentary functions once the cycle is well defined and in smooth operation. Donald Nelson feels that the proper spheres of jurisdiction between the two can be defined and kept in operation with himself as “umpire.”

Mr. Eberstadt, however, has gotten off to a flying start and in November was definitely in top position in WPB. His Controlled Materials Plan has been formally unveiled and is in rehearsal stage, with a functioning organization all set up and reshuffled for the job. As chairman of the Requirements Committee, he holds the strings over the flow of all materials and as chairman of the newly-created Facilities Board he is passing upon all construction of plant facilities.

Mr. Wilson, on the other hand, not only had to start from scratch within WPB but also had to wrest actual control over production scheduling from the military forces before he could set up shop. Donald Nelson always has had authority to direct production as chairman of WPB but last March this authority was delegated to the military when WPB’s Production Division was absorbed into the Army and Navy procurement divisions.

First step in restoring these powers to civilian control came in late November with Wilson’s establishment as the final authority over who shall turn out 1943’s doubled airplane program, including jurisdiction over the flow of parts and semi-fabricated assemblies to make the finished product. This grant of authority by Nelson forced a showdown between civilian and military production control which, before it was finally settled in favor of Wilson, was carried to the White House. Wilson

now not only directs airplane production but also all other military weapons on the same terms.

This authority stops short of the determination of how many of what kinds of weapons are to be made, but goes all the way on directing the production after that strategy decision is formulated.

Manning Table Plan

Chemical producers, along with all other essential segments of American industry to the war program, were offered in November a plan designed to permit an orderly withdrawal of draft-eligible men from their jobs. This is the Manning Table plan—so labelled not after a man’s name but as descriptive of its scope.

A Manning Table is a listing of different skills in a mine or factory and of the number of workers required in each skill to maintain production schedules. It also involves determination of the time required to train replacements for each skill. Superimposed upon this table is another showing the employees, by skills, who are subject to military call. The final step is working out of an orderly procedure for withdrawal of the draft eligibles as replacements can be prepared for their places.

Only those activities essential to the war effort will be permitted to have recognized Manning Tables. Voluntary at this stage, the plan is put in motion for a given concern by application to the War Man-power Commission for the standard forms and the assistance of government specialists in drawing up the tables. Once okayed by WMC, individual Manning Tables go to State Selective Service directors for certification numbers and these may then be attached to all Form 42A employer occupational deferment requests to local boards.

It is the intention of Washington that local boards will grant deferments specifically set up in Manning Tables and that such action will become almost automatic. Conversely, there is as yet not much emphasized thought that ultimately 42A’s without support of a Manning Table will get little attention.

More Alcohol Required

Production of alcohol remains one of the big problems. In spite of the success of the program for converting beverage distilleries the outlook for 1943 indicates that capacity operation of plants now making industrial alcohol will not meet soaring requirements.

During October the conversion of 21 distilleries brought the number of beverage plants now producing 190 proof alcohol to 45. Nine more plants were converted in November, adding one million gallons to the monthly production capacity. The schedule for further conversions was reported to the Industrial Alcohol Producers Advisory

Industry Committee by Dr. Walter G. Whitman, assistant director of the Chemicals Division, at the meeting of the Committee in November. Thirteen conversions during December will add four million gallons to the monthly capacity. The program will be completed by the conversion of 38 plants during January and February which should bring the total production of converted beverage plants to 19 million gallons by the end of March 1943.

Twenty-two plants will continue to produce high wines. The capacity of these plants is only about a million gallons and there is ample redistillation capacity to handle this amount. Only seven of the 60 distilleries included in the conversion program are expected to require new equipment.

Despite this, Dr. Whitman also said that it would be necessary to construct new plants to meet the 1943 requirements for industrial alcohol. No public utterance has been made as to the possibility of enlarging the conversion program to include sugar refineries and wineries which possibly could be carried out with less expenditure of critical materials and manpower than could the construction of the new plants.

However, the new plants forecast by Dr. Whitman may be tied into the findings of the Wheat Alcohol Research Program. The committee, consisting of O. E. May, Dr. D. B. Keyes and Gordon McBride, met in Peoria, Ill., early in November to lay out a course of action. Academic and industrial laboratories are now working with the committee to develop a standard practice or technique for converting wheat into alcohol. Participating laboratories are using samples of dried malt that have originated from the same source in order to reduce the variables to a minimum and all are working toward development of a method that will produce the maximum yield.

Use of government owned wheat now in the hands of Commodity Credit Corp. for conversion into industrial alcohol has been hampered by both mechanical and operational difficulties. The high protein content of the wheat produces excessive foaming during fermentation and the disposal of the spent mash is a poser. The mash is an excellent animal feed but the problem of drying the spent mash has here-to-fore hampered its utilization.

All of the surplus wheat that is available for the alcohol program is hard wheat. Soft wheat in the hands of CCC is on the West Coast out of reach for practical use and it represents only 10 per cent of the total government owned wheat anyway. Hard wheat is low in carbohydrates as compared to soft wheat and corn and high in protein compared to corn. Wheat is in great surplus and corn is scarce in spite of record yields this year.

Commodity Credit Corp. has insisted that the problem must be solved and on the first of December was about ready to announce the manner in which it could be done. Working with the flour milling industry which has considerable excess milling capacity, a

process was tried out in which the first step was the production of a coarse flour something on the order of breakfast cereals. The bran which contains the germ and the hull is separated and used for feed. The remainder—the coarse flour—which is almost pure carbohydrate, becomes the raw material that is converted into alcohol by fermentation.

This method has the obvious advantages of relieving the problem of dewatering the spent mash, and of providing a raw material for the making of alcohol which is more constant in its properties than if the whole wheat kernel were used. It is probable that experimental work will have progressed far enough for the complete process to be announced some time this month. Certain other advances in the technique of industrial alcohol production may also be announced this month. Together they will mean a very considerable increase in production from present facilities and a new source of raw material from which additional millions of gallons can be produced.

Efforts continue to reduce the consumption of alcohol for any purpose other than to satisfy direct military requirements. Reduction of 20 per cent in the allocation of acetic anhydride to the production of acetate rayon yarns for civilian products may be expected shortly.

In terms of alcohol, the saving that will result will amount to the production of a 12 million gallon plant. The tight situation in carbide also will be relieved.

Official announcement of the cut will be made some time shortly after the first of the year. The same move was proposed some months ago and did not go through when it was argued that the curtailment would result in many thousands of textile workers being thrown out of work. It would have been a serious dislocation at that early date.

But now the picture has changed. The men thrown out of work in the mills can now be employed in the manufacture of war goods instead of being engaged in making non-essential civilian goods.

Control of Materials

PRP has lost out. Taking its place will be the Controlled Materials Plan, a new allocation procedure in which steel, copper and aluminum will be allocated not only in pounds but also in accordance with specific production schedules. CMP gets an informal trial run in the second quarter of 1943, will become mandatory on July 1 of next year.

CMP is a vertical allocation plan instead of a horizontal one as PRP. Materials requirements—bills of material—will flow upstream from subcontractor to prime contractor to Washington through regular industrial supply channels. Allotted supplies of material will reverse the trip back through the supply line, also through industry.

At the top there will be only seven

claimants for the total supply of the three selected materials, Army, Navy, Maritime Commission, Board of Economic Warfare, Lend-Lease, Aircraft Scheduling Unit, and the Office of Civilian Supply. Prime contractors in each of these fields will submit their bills of material to their Claimant Agency; sub-contractors and supplies will submit their requirements to their prime contractors.

Announcement that AA-1 ratings for maintenance and repair items will be available the first quarter of 1943 will have little or no effect on present procedure. Actually it was a statement of policy. As such the announcement said definitely that WPB again was taking over some of the authority given to the armed services last June when the double A series of ratings was instituted to give production of armaments for the African offensive the right of way. The AA-1 rating can be applied to the purchase of repair and maintenance items only with specific authorization from Washington in cases of great urgency.

Of more immediate interest to the Chemical Industry is the probable revision, sometime this month, of the chemical industry repair order, P-89. If the contemplated revision goes through the AA-2x rating will be available instead of the A-1-a and A-1-c ratings assigned to the industry for the fourth quarter. The revision of the order makes the control much tighter. At the start more paper work will be required but once the transition is made paper work will be no more bother than it is at present.

Another possibility for P-89 is the proposal that its area be extended to cover many of the fringe industries. Drug manufacturers, oil mills, paint manufacturers, tallow renderers and many others must now file form PD-1A for individual requests. This proposal has been turned down at least once. At the moment there are about 500 firms to which serial numbers have been issued under P-89. If the benefits of the order were to be extended to the fringe industries about 3000 additional firms would become eligible.

New Setup in WPB

The materials distribution and operations side of WPB—as distinct from its scheduling and production offices—were merged and reshuffled in November as a preliminary to getting started with the Controlled Materials Plan. In the new setup virtually all authority flows directly to Ferdinand Eberstadt—the former office of Director General for Operations Ernest Kanzler, with the same title and functions, is now the administrative arm of Eberstadt's Office of Program Determination.

The reorganization grouped WPB's three-dozen plus industry and commodity branches, which are renamed divisions, into five newly-established bureaus each reporting directly to Kanzler and Eberstadt. Dr. Ernest Reid, long chief of the chemicals branch, heads one of these five bureaus

—the Commodities Bureau—under which is grouped the chemicals, cork-asbestos, pulp-paper, printing-publishing and containers divisions. Dr. Reid took with him as his assistant Hugh Hughes who had been chief of the Aromatics and Intermediates Section of the Chemicals Branch.

Named Director of the Chemicals Branch to succeed Dr. Reid was Dr. D. P. Morgan who has been with the branch since its organization as part of the National Defense Advisory Commission in June, 1940. Prior to his war job, Dr. Morgan was chemical consultant for Scudder, Stevens & Clark of New York and formerly was associated with Loomis, Stump & Banks, consulting chemical engineers, as a partner.

Other changes in the division moved J. W. Reynolds, assistant branch chief, to the post of deputy director, and W. Fletcher Twombly, analyst from the aromatics and intermediates section, to replace Mr. Hughes as chief.

Between the commodity divisions and the top offices, Eberstadt inserted a layer of policies agencies—a Program Bureau, Facilities Bureau, Distribution Bureau and Resources Agencies Bureau to work with the divisions in putting policy determinations into operation.

Few tears were shed over the demise of the Allocation Classification System which was killed off in one short sentence issued by WPB in November, which read, "Priorities Regulation No. 10, establishing the Allocation Classification System is hereby revoked." With the New Controlled Materials Plan in the offing, the cumbersome system of end use symbols was considered no longer of any value.

The Copper Division, however, continues the requirement of end-use information from brass mills, copper wire mills and copper foundries before making allocations. Customers of mills and foundries must supply as much end-use information as possible to enable their suppliers to get authority from WPB to fill the orders. Orders M-17 and orders in the M-21 series which require certain end-use information for the Iron and Steel Division are not affected by revocation of Regulation No. 10.

Presidential Authority

The President wants unrestricted authority to suspend, during the war and for six months thereafter, any international trade and passport barriers he feels interfere with the war effort. His request for legislation went to Congress shortly before the elections.

Spontaneous opposition to the "blank check" aspects of the proposal was strongly bulwarked by the election results and the prospects in early December were that the issue would be bequeathed to the incoming Congress where it is sure to find uphill traveling.

The requested authority is broad enough to authorize executive suspension of any law, including tariffs, which "interfere with the free movement of persons, property and information" into and out of the United States. Enabling legislation was introduced in the

Senate by Senator George only "by request" and with the announcement that House action would be required first. The enabling bill in the House was undergoing complete revision early in December to put curbs on the Presidential authority, but there appeared to be little chance of final action before the present session ends.

Roster of Technical Men

Demands for technically trained men has led the War Manpower Commission to urge senior and graduate students of chemistry, engineering and specialized fields to register their skills with the Nation Roster of Scientific and Specialized Personnel. The Roster now has listed over half a million names. It is a compilation of the nation's technical manpower resources for such uses as the war emergency may demand.

Registration is not to be considered an application for employment. Through cooperation with the local offices of the U. S. Employment Service industries in need of chemists and other specialists are able to find available men.

To register with the Roster, write to Dr. Leonard Carmichael, Director, National Roster of Scientific and Specialized Personnel, War Manpower Commission, Washington, D. C. Reference should be made to the fields in which the person registering has had training.

A month or two ago it was noted in these columns that the Chemical Warfare Service was in need of men. The men that CWS wants are experienced men who are over the draft age or are otherwise ineligible for military service. Men in the draft cannot be commissioned direct from civil life. They can enlist and go through the basic training period and become eligible for officers training school.

Changes continue to be made in the organization and personnel of the Chemical Warfare Service. Recently the Technical Division of CWS was moved from Washington to Edgewood Arsenal where larger space is available. All that now remains in Washington is a Liaison Branch. Col. Martin B. Chittick has been designated Deputy Chief of the Technical Division in charge at Edgewood. In the Office of the Chief of Chemical Warfare Service, Lt. Col. L. T. Sutherland has been appointed Chief of the Industrial Division.

FERTILIZER INDUSTRY EXPECTS ADEQUATE NITROGEN SUPPLY

Outstanding discussions of National Fertilizer Association and its membership at the recent Atlanta convention related to the supply of nitrogen for 1943 and to ceiling prices which are to be adjusted for the standard grades of fertilizers, the only types which can now be distributed legally. Incidentally the industry is very well pleased with the way in which the grade standardization has proceeded. It had an important part in the discussions and planning. The result is for each region

an entirely workable set of grade formulas.

Latest estimates of the Department of Agriculture indicate that the nitrogen shortage next year will be negligible. The nominal deficit is estimated to be about 32,000 tons of contained nitrogen for all classes of fertilizers. But actually 35,000 additional tons of nitrogen in oilseed meals will probably be available, more than enough to offset the apparent deficit.

COMPANY FORMED TO PRODUCE SYNTHETIC RUBBER

The National Synthetic Rubber Corp. has been formed to operate a new government-owned synthetic rubber plant to be built in Kentucky by the Defense Plant Corp. No details were made public regarding cost or plant capacity but it is expected that production will begin by June 1943. The new corporation is owned by the Minnesota Mining & Mfg. Co., St. Paul; Lee Rubber & Tire Corp., Conshohocken, Pa.; Goodall Rubber Co. and Hamilton Rubber Mfg. Co., Trenton, N. J.; and the Hewitt Rubber Corp., Buffalo. W. W. Benner, Lee Rubber & Tire Corp., is president of the new company and Dr. B. J. Oakes, Minnesota Mining & Mfg. Co., is executive vice-president and general manager in charge of operations.

NEW PATENT CONTROLS FIXED BY NEW RULINGS

A new law and several sets of new rulings affecting patents have lately established practices of importance to every research man and to every enterprise concerned with inventions or patents.

The new law (Public No. 768) provides for the government use of inventions and patents without regard to ownership. Compensation for such use is promised but delay to consider contract terms or compensation will not be necessary.

Two sets of rulings by Alien Property Custodian, L. T. Crowley, provide further for use in this country of foreign inventions and foreign-owned patents. In one of these rulings all drawings and specifications involved in applications for patents which have been seized because of alien ownership or interest, are now made available for domestic users. This represents a radical departure from normal secrecy. The purpose is to further the war effort without awaiting permission from owners for public use of facts or claims.

Another Alien Property ruling restricts transactions between U. S. citizens or companies and any foreign country or foreign national. No claims on behalf of foreigners may be filed or prosecuted.

Steps have been taken by Secretary of Interior Ickes also to insure more general public use of inventions and patents resulting from work of his department and its employees.

DATA ON CHEMICALS WITHHELD FOR MILITARY REASONS

Both the Bureau of Mines and the U. S. Tariff Commission are compelled to withhold from general distribution many of the valuable statistics which they gather currently from chemical process industry. Perhaps most missed by industry will be the pamphlet normally published by the U. S. Tariff Commission to give the annual figures on production and sales of synthetic organic chemicals. A preliminary summary has been issued but the final pamphlet is restricted for use within the government since it contains data of military significance.

Minerals Year Book, 1941, being published by the U. S. Bureau of Mines is similarly restricted.



FOR PRODUCTION EXCELLENCE

Among the companies which, in the past month, have been awarded the honorary Navy "E" and Joint Army and Navy "E" burgee for exceeding all production expectations in view of the facilities at their command, are included the chemical and explosives plants, the chemical process industries and the chemical engineering equipment concerns listed below. Other process and equipment plants will be mentioned in these columns as the awards are presented to the individual plants.

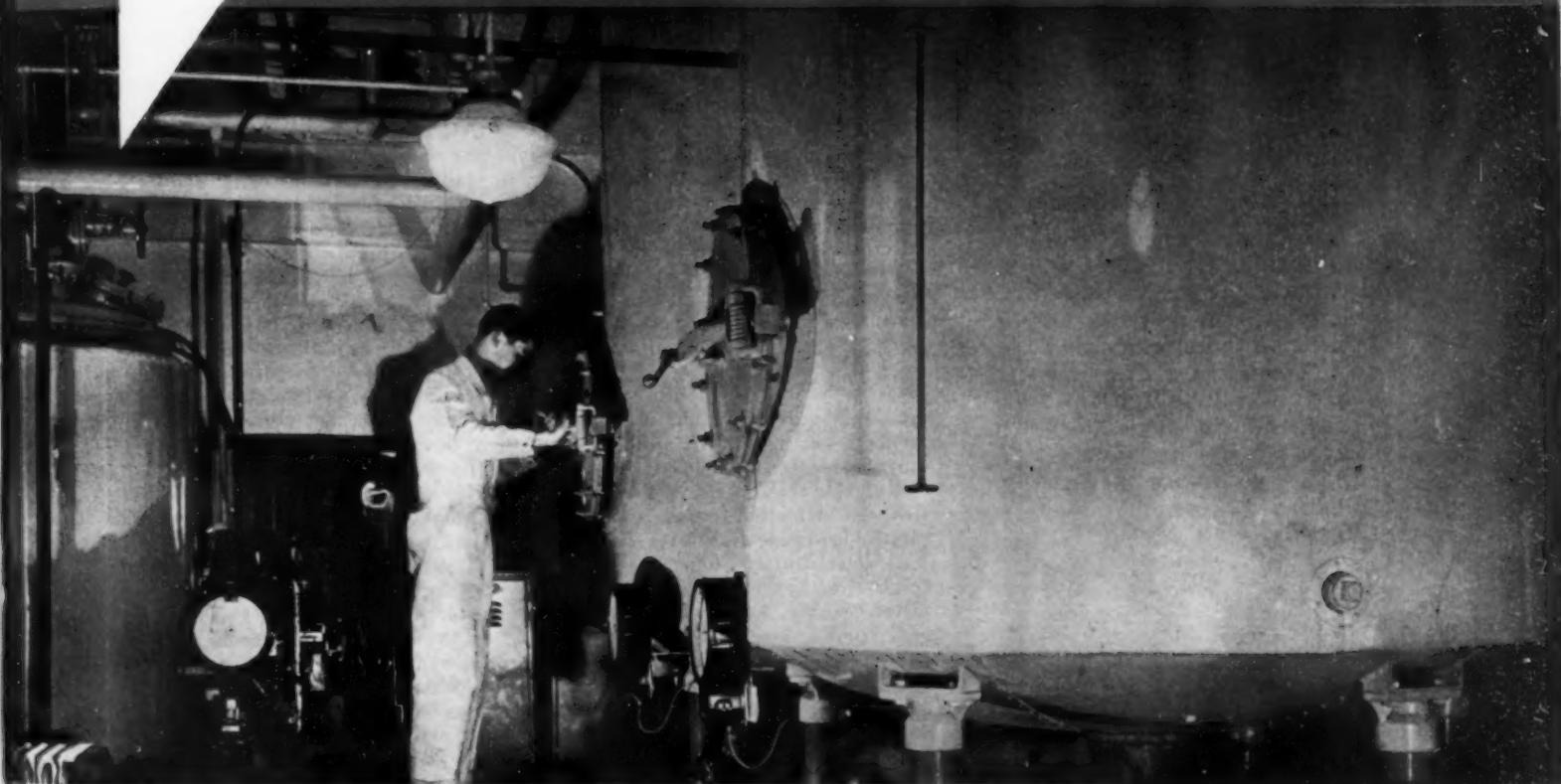
Acushnet Process Co., Bedford, Ohio.
Aluminum Co. of America, Niagara Falls, N. Y.; Aluminum Ore Co., Mobile, Ala.; Carolina Aluminum Co., Badin, N. C.; Republic Mining & Mfg. Co., Bauxite, Ark.
American Brass Co., Buffalo, N. Y.
Armstrong Cork Co., Lancaster, Pa.
Bethlehem Steel Co., San Francisco, Calif.
Buffalo Forge Co., Buffalo, N. Y.
Chromium Corp. of America, Chicago, Ill.
ClaroStat Mfg. Co., Brooklyn, N. Y.
Columbia Steel Co., Pittsburg, Calif.
E. I. du Pont de Nemours & Co., Nylon Research Laboratories and Pilot Plant, Wilmington, Del.; Repaune Works, Gibbstown, N. J.
Ferro Enamel Corp., Cleveland, Ohio.
The B. F. Goodrich Co., Akron, Ohio.
Hilton-Davis Chemical Co., Cincinnati, Ohio.
*Homestead Valve Mfg. Co., Coraopolis, Pa.
Ingersoll-Rand Co., Painted Post, N. Y.; Athens, Pa.; Phillipsburg, N. J.
International Nickel Co., Huntington, West Va.
The Jessop Steel Co., Washington, Pa.
Lempco Products Co., Bedford, Ohio.
Owens-Corning Fiberglas Corp., Newark, Ohio.
Procter & Gamble Defense Corp., Milan, Tenn.
Raybestos-Manhattan, Inc., North Charleston, S. C.
Rheem Mfg. Co., Sparrows Point, Md.
Union Asbestos & Rubber Co., Paterson, N. J.
United States Rubber Co., Des Moines, Iowa.
Winthrop Chemical Co., New York, N. Y.

* Received Maritime Commission "M" Pennant.

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tripled or quadrupled over former limits; nozzle openings, agitators, stuffing boxes and drives have undergone corresponding reinforcements. For example, forgings are used on nozzle openings where high pressures are involved.

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G. A. WELDING *Shop Notes*

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AIR RAID PRECAUTIONS AT BRITISH CHEMICAL PLANTS HAVE PROVED TO BE EFFECTIVE

Special Correspondence

A PRE-WAR visitor to British chemical plants who has been absent for some years must be surprised at the great changes which have been made in the meantime and are not, perhaps, so obvious to the British staff who have witnessed the gradual transformation. Most important, and most interesting to American observers, must be the arrangements for air raid precautions, and since these have stood the test of practice in many cases, it is possible to express a judgment on their merits. In principle A.R.P. problems in the chemical trades do not differ from those experienced in other industries; those of camouflage, protection, and training of personnel may require special attention, but on the whole they are not more difficult than in other large-scale industry. Anti-gas measures occupy a special position in British chemical A.R.P. because of the corrosive and poisonous character of many substances with which the chemist is concerned. If these are affected by explosions, the results may be far worse even than had war gases been used. The precautions against dangerous chemicals resemble those designed against gases. Equipment used to protect against gas will in most cases be adequate against chemicals, provided it is available in sufficient numbers and used with skill.

Where large tanks of strong acids and alkalis are concerned, the authorities demand that special attention should be paid to careful inspection immediately after raids, even though bombs may have been dropped some distance away, for cracks may develop and require special treatment. Adequate stores of a neutralizing agent and adequate drains to absorb escaping liquids, supplemented possibly by dams to direct fluids into the drains and away from other parts of the plant are also necessary, and maintenance of good supplies of water for flushing down escaping chemicals is urged. As a protection for surface tanks blast walls are suggested and underground pipelines may be protected by trenches on either side which serve the double purpose of breaking earth shock waves and trapping escaping liquids. Extra shut-off or non-return valves may help to localize damage, and de-contamination centers must, of course, be provided to allow personnel to lay off damaged clothing.

A special problem is presented by the fact that the concentrations in which dangerous substances may be met can be very heavy. Where ordinary gas masks would not prevail, special breathing equipment is therefore provided. Special care is taken with some such products as liquid chlorine, ammonia and organic solvents. Liquid chlorine in rail tank-cars should be shunted into sidings protected by blast walls and equipped

with a sump and hose. Special equipment is provided in refrigerating plants using liquid ammonia. Regular inspections of autoclaves, steam economizers, high-pressure air and steam plant, etc., is recommended, and apparatus for regular recording of pressures and temperatures, preferably with automatic alarm devices, has been found useful. To make the best use of these arrangements, however, thorough training of personnel is necessary. Workmen should take part regularly in the tours of inspection and be made acquainted with the special problems and dangers involved so that in an emergency reliance can be placed on a general sense of individual responsibility.

Another precautionary measure in many plants is the provision of alternative sources of energy. Industrial gas producer plants have been installed in many factories, and certain conclusions may be drawn from the experience gained with them. The cost of operation is generally higher than was the gas taken from a large plant, because the small producers require special attendance and maintenance which only in few cases can be arranged in such a way that the labor bill is not materially affected. The fuels mostly used for producer gas plants in England are anthracites, gas cokes and hard cokes, carbonized briquettes, dry steam coals and non-coking bituminous coals—all of which are not-swelling and not-caking when heated. In mechanical types of plant coals of a slightly coking character can be used. Since so large a variety of coals is available, the choice in individual cases depends primarily upon the use to which the gas is to be put. Bituminous coals can be used with advantage for making crude gas for heating, but low volatile fuels are believed to be better for heating and to have certain operational advantages such as absence of tar deposits in gas mains and ease of purification.

Material for Refractories

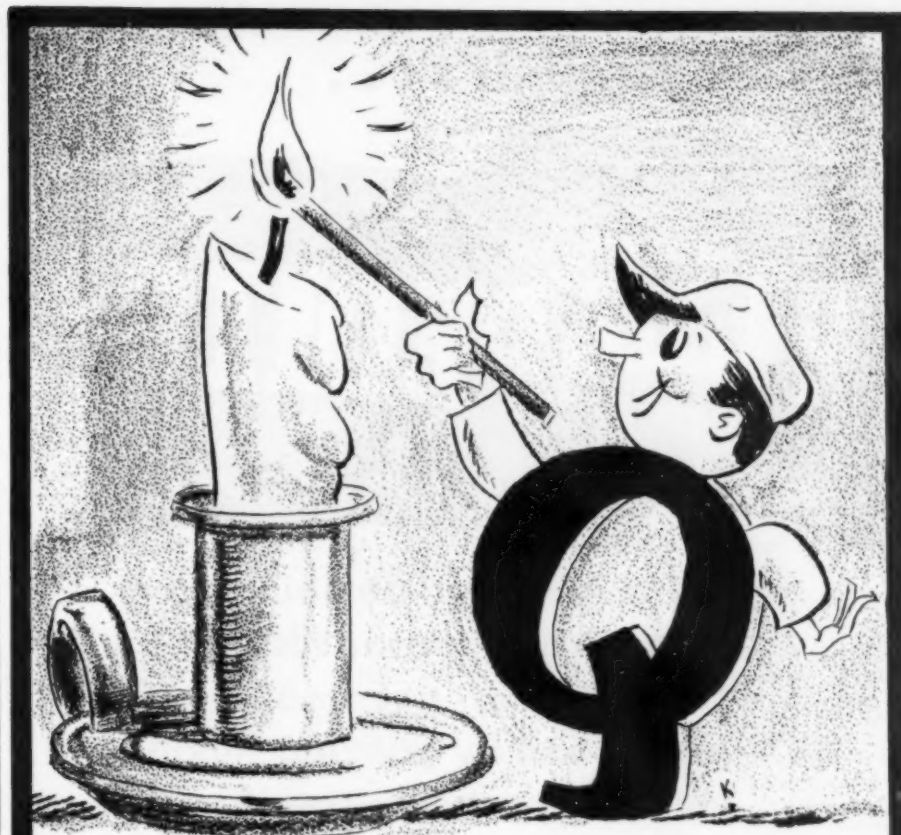
Since some of the materials used for refractories used to come from Continental Europe and are no longer available to British users, attention has been directed to alternative refractory materials. Experience with chrome-magnesite and stabilized dolomite bricks used in the place of bricks embodying a larger amount of magnesite in large basic open-hearth tilting furnaces was described to the Iron and Steel Institute by A. Jackson. While magnesite and chrome-magnesite bricks are not of the same high quality as that attained about three years ago, chrome-magnesite bricks are probably still superior to dolomite for the linings of open-hearth tilting furnaces above the slag line, but stabilized dolomite bricks can be used in the lower

portions of the hearth to replace magnesite. Magnesite bricks are still the only satisfactory bricks for use about the slag line. Stabilized dolomite cements may replace a reasonable portion of the chrome-magnesite cement used for lining maintenance if present experiments prove successful. The dolomite used for ordinary fettling must be fully shrunk and in good mechanical condition to give the maximum reduction in the consumption of magnesite and chrome materials. A chrome-magnesite paste used for patching linings now contains 40 percent of magnesite, against upwards of 70 percent formerly.

Much new chemical apparatus which used to be imported from Germany is now made in England. Information on this point is naturally scanty and mostly not for publication. But mention may be made of a few developments. Agate mortars and pestles are among the chemical laboratory equipment now being made in England. They are available in two sizes and are preferred to other material which is offered as a substitute of agate because their hardness is not affected by humidity or when a substance is ground under a liquid. A new high-temperature platinum alloy is now used in a laboratory furnace for use at temperatures up to 1400 deg. C. for which carborundum elements of German origin used to be employed. The alloy is wound on a refractory tube 12x1½ in. bore which is enclosed in a second refractory tube, the space between the two tubes being filled with pure fused alumina. The outer tube is surrounded with a medium-temperature heat insulation. A life of at least 1500 hours is claimed for the element which, of course, has a high scrap value. The production of heavy chemical glassware (desiccators, aspirators, drying towers) and of laboratory porcelain has greatly increased thanks to the help of refugees from enemy-occupied countries. Experts with personal experience in leading German glass and porcelain factories have begun to produce similar articles of equal quality in English works. A large factory for quantity production of volumetric glassware has been built, and better grades are now on a semi-mass-production scale. Precision bore tubing in glass has been done in England since the outbreak of the war, though on a small scale, and other laboratory equipment is now made in large numbers.

Wetting Agents from Petroleum

A new plant erected by Shell Refining and Marketing Co. Ltd. is using special processes for producing the sodium salts of higher secondary alkyl sulphates synthesized from byproducts obtained in petroleum refining. The byproduct is cracked under carefully controlled conditions to produce a mixture of olefines which is fractionated and a special cut which research has shown to possess the optimum balance of wetting and detergent properties is isolated. By treatment with acid under strictly controlled conditions a



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crude sulphated product is obtained which, after neutralization, is subjected to special purification processes insuring the removal of any reaction byproduct that may adversely affect the quality. The final product—a mixture of the sodium salts of the corresponding secondary alkyl sulphates—is a clear, pale liquid at 15/20 deg. C., becomes cloudy at lower temperatures and at still lower temperatures forms a gel. It is soluble in water at all temperatures, gives clear neutral solutions with very considerable reduction in surface tension, and can be used in acidic or alkaline media, hard water, etc. It is unaffected by chlorine, and since it does not contain any natural fats, rancidity effects cannot arise from residues which may be left behind owing to inefficient rinsing. It is hoped to develop a large outlet in the textile industry, e.g., for scouring raw wool which it is claimed to make cleaner, less yellow, softer and more lofty. The new detergent also lends itself for use in connection with cotton.

A National Registry of Rare Chemicals has been suggested in England because small quantities of these materials which are now difficult to obtain may be held in some unsuspected place while urgently required somewhere else. It is not thought advisable that chemicals regularly shown in the supply lists of large chemical supply houses should be included in the register, but rare chemicals which are not normally sold from lists should be made available to a wider circle of customers. It is suggested that names of suppliers, location, and amount available should be made available, but the list thus compiled would not be published. Potential consumers would be asked to inquire for specific chemicals at the central registry, and the owner need not even give his name if he wishes to remain anonymous. A certain amount of work of this kind is presumably at present done by the Miscellaneous Chemical Control.

NEW OILSEED CRUSHING PLANT FOR HAMILTON, ONTARIO

Sir Walter Carpenter, head of the Carpenter Organization which has very extensive interests in Australia, New Guinea and Vancouver, B. C., announced on his arrival in Vancouver recently that his company was planning to expand its activities in Canada and establish a plant at Hamilton, Ont., to produce vegetable oils, especially for the production this year of linseed oil.

He stated that the Vancouver plant, which is the only one in Canada, originally established early this year for production of oil and cake from copra, would also engage in linseed oil production, as well as copra, and bean oil. Alberta linseed will be handled by the Vancouver plant, and Ontario products at Hamilton. The equipment for the Hamilton plant will be shipped immediately from Vancouver. It will consist of one of the units from the Vancouver plant.

NORTH AFRICAN SUPPLY OF PHOSPHATE ROCK CUT OFF FROM GERMAN-DOMINATED EUROPE

Special Correspondence

EDITOR'S NOTE: Cut off from direct correspondence with all except a few foreign sources in neutral countries, these notes interpret recent developments in continental Europe as reported in publications and official documents received in the United States. These monthly letters, prepared in this country, will be continued only so long as pertinent material of interest to American chemical industry is available for our comment and interpretation.

American military action in North Africa will further curtail the already limited supply of phosphatic fertilizers available to German-dominated Europe. Because all former sources of phosphate rock except North Africa had been cut off, superphosphate fertilizers have been severely rationed the last three years (see *Chem. & Met.* August 1942). Earlier this year it was reported that Tunisia, chief African producer, was shipping phosphate rock to Italy and Germany at the rate of about 60,000 tons a month, which is far below the Reich's peacetime imports of one million tons a year, to which must be added another 400,000 tons of basic slag, or Thomas meal, imported from western Europe for fertilizer purposes.

In recent years, phosphate rock output of Tunisia, Morocco, and Algeria together just about equalled total United States production. In 1939 Tunisia produced 1.6 million tons (1938: 1.9), French Moroccan shipments were 1.5 million tons, and Algerian production was .5 million tons. Aside from small deposits in Spain and in the Somme region in France, Europe has no important phosphate rock deposits outside the Soviet Union, which produced around a million tons of phosphate rock in recent years. So far, Soviet phosphate production has been beyond the reach of the Nazis. Important deposits are located in the Kola peninsula south of Murmansk. Vast new deposits were discovered in 1936 south of Kasachstan near the Caspian. Kirovsk and Karabugaz, two important superphosphate producing centers, are likewise beyond German-controlled areas.

Probably the Reich had stockpiled enough phosphate rock supplies to take care of technical phosphoric needs as for the "bonderizing" processes, which have grown in importance as a means of overcoming the necessity for tinplating, and also for extending soaps. But the further curtailment of bulk phosphatic fertilizers is bound to result in a decline in crop yields and food supply. The Axis will also now be deprived of the sizable vegetable oil and wine exports of North Africa.

War is causing considerable shifts in the German chemical industry, both in production and in the composition

of foreign trade. Although neither production nor export figures have been published for some time, the assumed requirements of the markets for which the Reich chemical industry is now producing make possible some comparisons with pre-war conditions.

In the earlier phases of the war, receding trends were recorded in branches dependent largely on exports or purely civilian consumption or which were unable to obtain imported raw materials. This cut down production of dyes, pharmaceuticals, paints and pigments, and soaps. At the same time it intensified production of industrial chemicals as sulphuric, nitric, acetic and other acids, alkalis, electrochemical products, and coal tar derivatives.

Sulphuric Acid Production

In the meantime, the dropping off of imported pyrites, which formerly supplied three-quarters of the raw materials for the Reich sulphuric acid production, cut down domestic output of this acid. This has been partly offset, however, by increased domestic production of pyrites, recovery of sulphur from coke-oven gas and gases used in synthetic motor fuel production. There are also other less satisfactory ways of getting around the sulphuric acid raw material which are undoubtedly being used increasingly. One of them tried in World War I was the uneconomic processing of gypsum which was abandoned after the war and then resumed in 1937 at I. G. Farben's Wolfen plant, which has been producing 80,000 tons sulphuric acid a year by an improved process developed at Leverkusen (see *Chem. & Met.* May 1940). Gypsum is also being used instead of sulphuric acid to provide the sulphur content of ammonium sulphate in the I.G.'s huge Leuna works near Merseburg. Increased recovery of sulphuric acid and carbon bisulphide used in synthetic fiber production also has probably resulted in some savings.

Increased needs for dyes for military uniforms have probably not offset the large declines in exports and requirements of dyes for diminished textile production in all parts of German-dominated Europe. What will happen to export dye markets formerly controlled by the Reich and now supplied by other countries is an interesting speculative topic. In recent years the German dye industry has depended on exports to dispose of roughly 50 percent of its dye output.

Before World War I, Germany's dye production, which supplied 88 percent of the world trade in dyes, amounted to an estimated 135,000 metric tons a year, including 22,000 tons of synthetic indigo. During World War I domestic production in other countries toppled Germany's monopoly. In postwar

Stearns

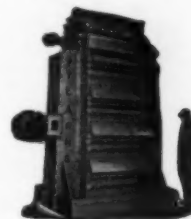
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years, through specialization on new dyes and intensive cultivation of markets and underbidding competitors, Reich producers were able to recover a considerable part of the lost markets.

By 1928 it is estimated that the Reich's dye production had dropped to 80,000 metric tons. A French estimate at that time, which was not challenged, was that I. G. Farbenindustrie alone produced 72,000 metric tons of this amount. In 1927 when Germany's dye trade was fairly normal, dye exports (practically all of which were supplied by I. G.) were valued at 220 million RM, which was higher in value than the Reich's exports of nitrogen products.

By 1937 Germany's coal-tar dye production was estimated at around 100,000 metric tons. The total value of world exports of coal-tar dyes in that year was 258 million RM, of which Germany supplied about 43,000 metric tons, worth 148 million RM, or around 56 percent of the total world trade. In 1938 its share dropped to 109 million RM. World output of dyestuffs in 1939 was estimated at approximately 200,000 metric tons. In the first nine months of 1939 German exports of dyes and intermediates were around 24,000 metric tons, valued at 76 million RM.

Fat and Oil Shortage

The shortage of imported oils has drastically curtailed soap output. Before the war, 240,000 of 400,000 tons of technical fats were consumed in the Reich soap industry. The present shortage has led to an increased use of substitute and filler materials in soap making. The production of synthetic fatty acids at Witten and Magdeburg which was claimed to have reached 60,000 metric tons by the end of 1939, and has probably increased further with synthetic paraffine output from Fischer-Tropsch motor fuel plants, does not go far enough to relieve this shortage. As a result some entirely fatless soaps and detergents are now being made.

Some of the new soaps are reported to be harmful to the skin and also to have a disastrous effect when used in washing new synthetic textiles. As a result, the Reich office for industrial fat supply is insisting on testing all new materials before they are put on the market. The necessity for this recent move is apparent from reports that in addition to the one standard "Einheitsseife" there are now 1700 soap-saving materials in Germany. This includes shampoos, detergents, as well as scouring agents. German hand-soaps now generally consist of 80 to 95 percent abrasives and fillers like pumice powder, kaolin, etc.

Most of the soaps contain less than 3 percent fat in the form of soap powder. It is admitted that hardly any natural fatty acids are used for these soaps, but only substitute materials made from naphthalene or paraffine. To form a lather, chestnut meal or saponin (from imported bark) is

added to most of the substitute soaps. Considerable amounts of soda and sodium silicate are also used in these soaps.

Balkan Chemical Developments

Increased light metal production has stimulated demands for bauxite from Hungary, whose reserves of 250 million tons are the largest known in Europe. Before the war, France, whose bauxite reserves are estimated at only 60 million tons, outproduced Hungary. In the meantime, however, intensive developments are believed to have put Hungary into first place. Yugoslavia, whose reserves are estimated at 100 million metric tons, ranks behind Italy as the next most important producer.

Near the Yugoslav Dalmatian deposits, located in the vicinity of hydroelectric power—in contrast to Hungary which is deficient in power supply—German interests are trying to develop a Croat aluminum industry. The Kroatische Aluminum A.G. was recently founded at Agram (Zagreb) with a capital of 20 million Kuna to establish aluminum factories and to exploit Croat bauxite deposits. German members of the board of directors of the new company are either officials of the Reich government or of the Vereinigte Aluminiumwerke A.G., Berlin, which is the state-controlled largest aluminum producer in the Reich. In 1941 Croatia mined 211,000 tons bauxite, 462,000 tons iron ore, and 3,804 tons manganese.

Italian efforts to prevent Germany from monopolizing the development of Balkan areas is indicated in a recent announcement that Montecatini, Italy's big chemical trust, recently established branches in Croatia and Greece for distributing artificial fertilizers. Montecatini is also planning to establish similar branches in Bulgaria, where it is reportedly negotiating for the establishment of a synthetic textile industry, probably to produce lanital-type fibers.

As a result of growing war requirements of fluorspar and fluorides used in making steel and aluminum, as well as for making glass, Germany, already one of the world's big producers, is trying to increase its output. At Ilmenau in Thuringia, important producing district of Germany, a valuable colorless spar is reported being mined for use in optical lenses. Recently I. G. Farben and Ruetgers Co., coal-tar producer in the Reich and in Bohemia-Moravia, formed a company, the Fluszsparwerke G.m.b.H., with a capital of 800,000 RM for the development of fluorspar deposits and manufacture of fluorspar products in Germany, other European countries, and "overseas territories belonging to continental states."

Ceramics Used More Widely

Ceramics have long been used in the Reich to replace metals, especially in chemical equipment. Of the one-half million tons of stoneware products made in Germany in 1938, the largest part of course was for canalization

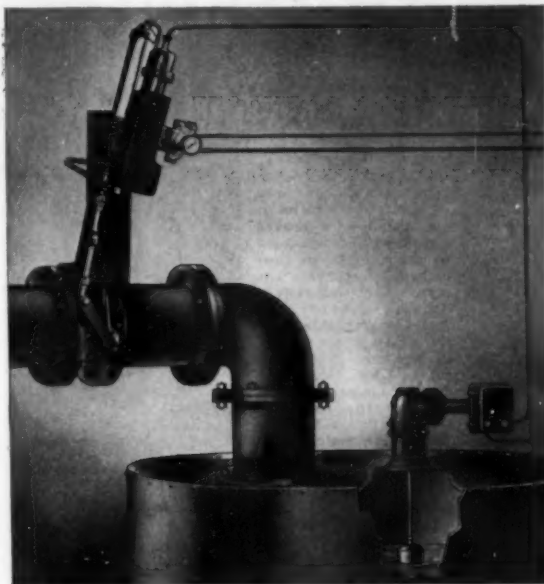
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ROUND CORNERS ARE STRONGER

The ordinates represent the approximate character of maximum stresses in the region of a square corner in a vessel under pressure. Note the considerable increase in stress at the corner. This is due to high stress concentration in the sharp angle and to discontinuity stresses originating from the rapid change of direction of the surface.

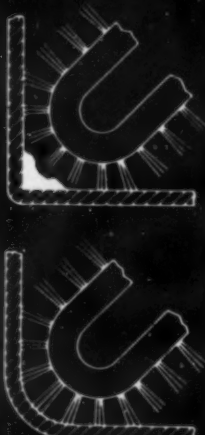
The ordinates here represent the approximate character of maximum stresses in the region of a round corner of a vessel under pressure. Stress concentration is entirely eliminated, discontinuity stresses are smaller. Hence there is little increase in stress at the corner. Equipment stands up better.



ROUND CORNERS ARE EASY TO CLEAN

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In Blickman round corner construction the brush has no difficulty in cleaning the entire surface of the round corner. Cleaning with ordinary brushes is a quick process. Shutdown time for cleaning is appreciably lessened. This saves time and reduces the danger of contamination and corrosion.



and agricultural drainage pipes to replace cast iron.

In the chemical field, ceramic acid containers ranging up to 5,000 liters in capacity are being widely used to store or transport acids. For constructing chemical equipment the ceramic product is claimed to have advantages over porcelain in that it can now be ground to tolerances of one-thousandth of a millimeter, which makes it possible to use it more extensively to construct pumps, valves, and other parts which have to be air- and water-tight.

Substitutes for Metals

In addition to being made into containers, distilling coils, pipes, pumps, etc., ceramics free of iron content are being more widely used in place of metals in acid plants than heretofore. In equipment for making sulphuric acid, the filling as well as complete Glover and Gay-Lussac towers, inside and outside, are now being made entirely of heavy stoneware. For hydrochloric acid production the same materials, only in white ceramics, are being used. Increasing substitution of ceramics for lead, corrosion-resistant steels, and wood, is also reported, not only for the chemical industry but also for the electrical, textile, cellulose, and explosives industries.

Ceramic tools that cut wood, glass, stone, and concrete are supplanting steel tools for some uses. Under a new Reich patent, a mixture of highly refractive aluminum oxide and chromium oxide is molded into the desired shape and then sintered at 1600 deg. C. This bonds the ingredients so that the abrasive has a fine crystalline structure, which is claimed to be superior to steel because it does not heat to as high temperatures as steel from cutting friction.

Tool steels which formerly were alloyed with imported nickel, chrome, manganese, and tungsten, are now made from local steels strengthened with ores from recently occupied territories. It is claimed the new steels are satisfactory enough for certain purposes that they might be exported even in competition with usual tool steel alloys when Europe resumes trade with overseas.

CANE MOLASSES STUDY STARTED AT MELLON INSTITUTE

P. Duff & Sons, Inc., Pittsburgh, has founded in Mellon Institute an Industrial Fellowship that will be concerned with the scientific investigation of problems in the production, improvement, properties, and uses of cane molasses; the development of better and new cake mixes, and the evolution of other ready-to-use mixes for baking purposes, embracing composition, preparation, packaging, and storage. Arthur J. Nolte, a food specialist, assumed the incumbency of this Fellowship on Oct. 22. He will have the direct cooperation of specialists in the Fellowship donor's organization and in the Institute.

READERS' VIEWS AND COMMENTS

WHAT'S TO COME?

To the Editor of Chem. & Met.:

Sir:—The editorial statement by Mr. McGraw in your October issue summarizes in an excellent manner the contribution of the chemical engineer to the war effort. It goes without saying that without the advancement made in the chemical and metallurgical industries during the past twenty years, we would be seriously impeded in our attempts to provide materials and equipment to fight a global war.

And yet it seems to me that the greatest achievements of the chemical engineer will be apparent after the war. For, regrettable as war is, it is none the less true that technical progress of a decade or more is accomplished practically over night under the stress of wartime needs. The development of the National Emergency Steels is only one of the numerous examples which could be cited.

Our company, along with hundreds of others, will be vitally affected by chemical engineering progress in the post-war era. For the present, of course, all of our energies are centered on production to hasten its coming. We hope it may be soon.

WALTER GEIST

President

Allis-Chalmers Manufacturing Co.
Milwaukee, Wis.

TOWARD HIGHER STANDARDS

To the Editor of Chem. & Met.:

Sir:—Your splendid editorial by Mr. McGraw on the accomplishments of the American chemical industry especially interested me in that section which refers to the synthetic rubber program. It is indeed helpful to have your authoritative voice direct attention to the tremendous requirements of that job in terms of time and material.

There is no question, I think, but that editorial articles of this kind can be an important factor in bringing about a better understanding of the part played by progressive industry—through research and development—not only solving wartime problems but in lifting peace-time standards of living to ever higher levels.

JOHN COLLYER

President

The B. F. Goodrich Co.
Akron, Ohio

DOMESTIC Vs. IMPORTED

To the Editor of Chem. & Met.:

Sir:—In reference to the article entitled "An American Source of Natural Resins for the Paint and Varnish Industry" by Adriaan Nagelvoort in your October issue, it is unfortunate that the author did not confine himself to his topic, namely the description of resins from coal. When he wandered off into the realm of what he

believed to be competitive material, he was distinctly unfortunate in creating impressions or reaching conclusions which cannot be substantiated.

A brief reading of "The Technology of Natural Resins" by Mantell, Kopf, Curtis, and Rogers, John Wiley & Sons, 1942, will demonstrate that the phrase "most highly prized are the fossil resins, since they make the best and most satisfactory surface coatings for most industrial purposes" does not describe the situation.

A glance at Mr. Nagelvoort's table of imports of varnish gums will show that the bulk of the imports is damar, which is not a fossil resin, and that the bulk of the large figure entitled "Other Varnish Gums" is almost entirely manila copals, which are not fossil resins. Only kauri and congo are in the fossil class. These fossil resins in normal years constitute less than ten percent of the total imports of natural resins.*

The writer several times in the last decade has run commercial evaluations of the resins described in the article. Their insolubility in alcohol did not allow them even to be considered as a replacement for the alcohol-soluble manila copals of which more than 20,000,000 lb. are annually imported, nor did they have the compatibility with cellulose material as is shown by damar of which over 19,000,000 lb. are annually imported, nor were they able to give varnishes sufficiently light in color to compete with the kauri and congo materials, nor did they in any way have characteristics of sufficient interest to allow them to replace in all or part the alkyd resins or ester gums or the modified phenolic resins.

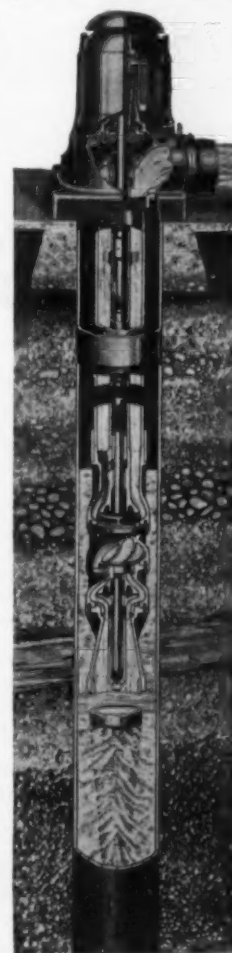
Statements as to dependence on foreign sources of resins must take into account that the United States is by far the largest producer of natural resins in the world, particularly when rosin production is taken into account. The annual production of rosin is given in millions of barrels of 500 lb. gross per barrel, or billions of pounds. Rosin in its untreated form, in its limed form, or in its glycerine ester, and as the major constituent in the modified phenolic resins, the rosin-modified alkyds, the maleic acid resins, as well as in other combinations, is the most important constituent of the synthetic resin field. It is also interesting to note that rosin exports are spoken of in terms of hun-

* This table of imports, inserted by the editors and entitled "United States Imports for Consumption of Varnish Gums", was misunderstood by Dr. Mantell. There is no mention or even inference in the table or in the text reference to the table that fossil resins only were considered. The purpose of the compilation was to show United States imports of natural resins, now largely unavailable to this country, used in the paint and varnish field for which Mr. Nagelvoort claims to have a suitable substitute in the Utah coal resins. In this interpretation, the table is entirely correct as it appeared.—Editors.

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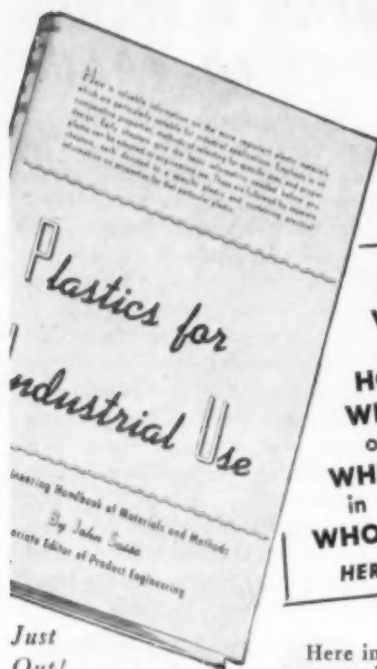
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dreds of millions of pounds. In terms of dependence on foreign sources, except for natural resins of specific characteristics, stable in quality and of long-standing in world commerce, the United States has no dependence on foreign sources, but instead supplies a large portion of the world.

The inference in the article in the expression, "This present war should free the United States of dependence on foreign sources for its supply of natural resins" seems to stem from lack of understanding of the qualities of the imported natural resins, their place in commerce, their specific utilization, and their complementary and supplementary field in usage in connection with the synthetic materials. The further statement, "The utilization of our own natural resins at this critical time would also release for more important war uses some of the glycerin, alcohol, phenols and other chemicals that are now being used in large quantities in making synthetic resins" is a type of expression which is so definitely misleading and without substance that its inclusion is particularly unfortunate.

C. L. MANTELL,
Netherland Indies Laboratories
New York, N. Y.

FOR DOMESTIC RESINS

To the Editor of Chem. & Met.:

Sir:—After writing a very readable book on natural resins which extols the virtues of the imported resins, Dr. Mantell now quotes it as the authority in the whole field, and can see no place in the sun for Utah resins. In some respects, he reminds one of Rostand's delightful character, Chanticleer, who thought the sun came up over the eastern horizon because he crowed!

However, let us see what others think of the book before we accept its authority too literally. In the June, 1942, issue of the *Journal of American Chemical Society*, B. T. Brooks says: "The title of this volume is a little misleading, as two of our most important natural resins, common rosin and shellac, are not included. . . . The authors are naturally interested in promoting the use of the particular resins in which they are commercially interested. . . ."

Again, in the July 10 issue of *Chemical & Engineering News*, J. Vernon Steidle says of Dr. Mantell's book: ". . . The chapters dealing with the uses of natural resins in varnishes, paints, water emulsions, etc., suffer greatly because of the exclusive and biased standpoint from which they are written. Exclusion of the synthetic resins, rosin and shellac makes it impossible to give a true or valuable picture of the industries or products involved. The subjects discussed should be studied in a source with a less biased viewpoint. . . ."

Dr. Mantell may be correct when he claims that "several times in the last decade" he has had samples of Utah resins and found them wanting each

time. The resins he analyzed were evidently the crude material from a flotation process or from a coal washery. These are contaminated with wax and asphalt, and naturally he could not make a good varnish from them comparable to a varnish made with kauri or congo. In this respect, Dr. Mantell's statement merely confirms the purpose and claims of my article—that to make the Utah resins acceptable to the paint and varnish industry they must be processed.

Therefore, before issuing a second broadcast condemnation of my claims on the possibilities of Utah resins for the paint and varnish field, Dr. Mantell will probably be interested in making some tests on the *purified* resins as described in my article. He may obtain samples of these whenever he decides to ask for them.

Neither the table of imports nor the context of the article states that only fossil resins were considered. I believe it is correct, however, to say that fossil resins in general make better varnishes than other varnish resins—certainly the trade pays more for them!

ADRIAAN NAGELVOORT
Washington, D. C.

TOM CAT OR TABBY?

To the Editor of Chem. & Met.:

Sir:—Anent your exchange of letters with Dr. Charles L. Parsons, secretary of the American Chemical Society, (See *Chem. and Eng. News*, Nov. 10, 1942, page 1384) it occurs to me that no chemist is competent in all branches of chemistry, and no engineer is competent in all branches of engineering. The abilities of technically trained men, with the same basic background, will depend upon the nature and scope of their post-graduate study and experience. In nature, chemistry, physics, and engineering are inextricably mixed, though this is most noticed in large scale operations, where financial considerations also enter as a main factor. A man *is* what he successfully works at, call it what you will. The subjoined jingle voices this view.

JEROME ALEXANDER
Consulting Chemist and Chemical Engineer
New York, N. Y.

Avoiding a Cat-a-strophe

"Which came first, the hen or egg?"
In seeking truth, no question beg.
We now believe they came together,
Though eggs preceded birds with feather.

When Man first made a fire to cook,
Then mixed a mess, and took a look
To see what outcome would appear—
He Chemist was, and Engineer.

Into this state, where joy was Rex,
The Kirk and Parson inject sex.
"Which is the Tom, and which the Tabby?"

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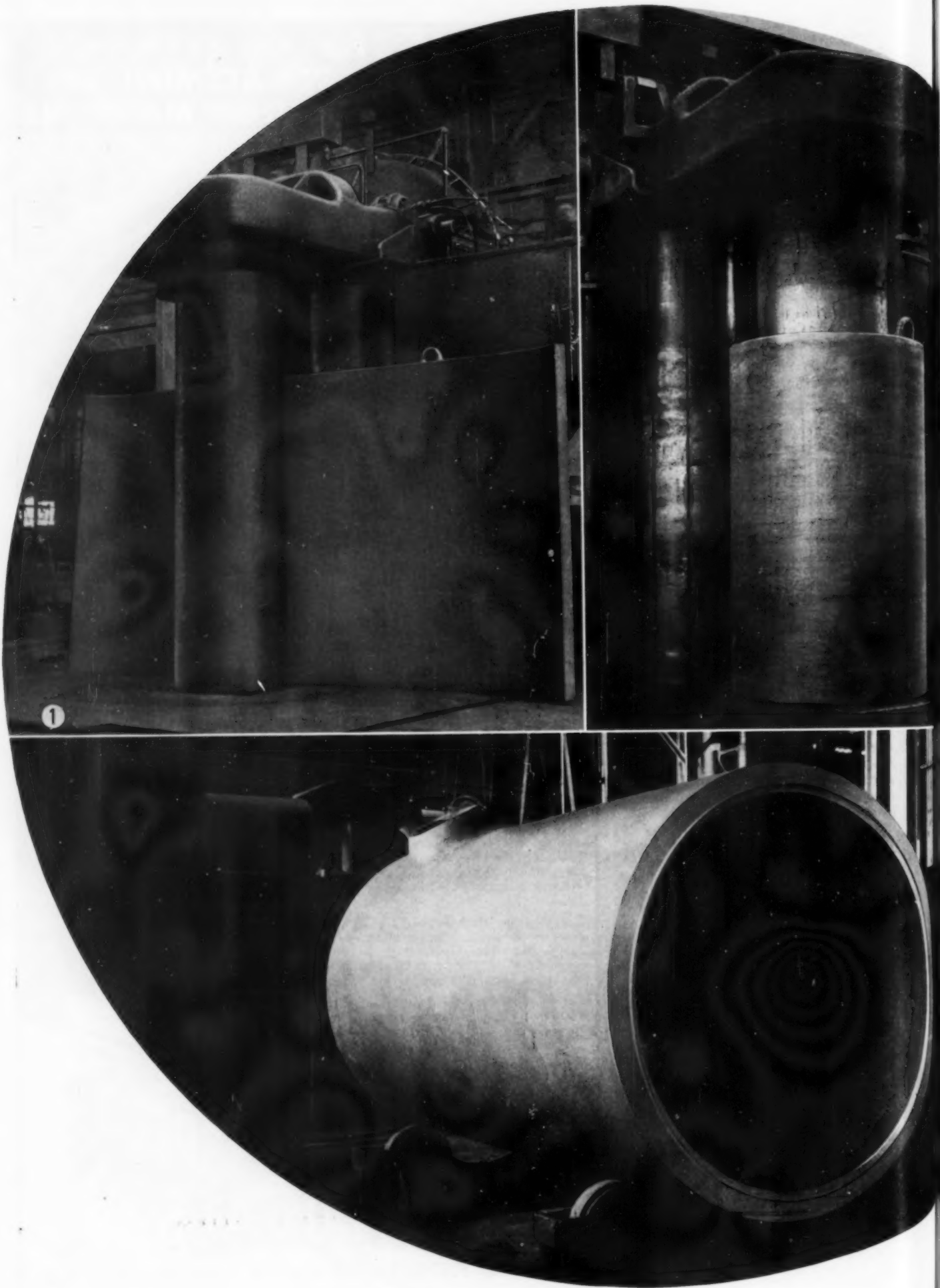
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PERSONALITIES



E. W. Reid

♦ ERNEST REID, who for some time has served as chief of the Chemicals Branch, Materials Division, War Production Board, has been appointed director of the Commodities Bureau of WPB. Dr. Reid came to the government service from his position as assistant director of the Mellon Institute of Industrial Research, Pittsburgh.

♦ R. C. RICH is connected with the Monsanto Chemical Co., Texas City, Texas. Mr. Rich is personnel director.

♦ ERNEST SCHELLER, who was research director, is now assistant to the president and general manager of the Foil Division, Reynolds Metals Co., Louisville, Ky.

♦ JOSEPH D. SURMATIS has recently joined the staff of Gustavus J. Esselen, Inc., Boston, Mass. Prior to joining the Esselen organization, Mr. Surmatis had been for the past two years instructor in chemistry at the Pennsylvania State College and assistant to Dean F. C. Whitmore.

♦ WALTER J. MURPHY, editor and general manager of *Chemical Industries*, has been elected alumni member of the corporation of the Polytechnic Institute of Brooklyn.

♦ JAMES E. COPENHAVER, formerly professor of organic chemistry at the University of South Carolina, is now conducting research work on pulp, paper and paper products for the Sonoco Products Co., Hartsville, S. C.

♦ FLOYD TODD joined the laboratory staff of Quaker Chemical Products Corp., Conshohocken, Pa., in a research capacity. His initial work will be in the field of metal corrosion.

Mr. Todd was formerly connected with the Atlantic Refining Co. and Sharp and Dohme Co.



D. P. Morgan

♦ D. P. MORGAN has been elevated to director of the Chemicals Division, War Production Board. Dr. Morgan has already assumed his duties, thus releasing Dr. Ernest Reid, the former director, for his new appointment as director of the Commodities Bureau. Before going to Washington in June, 1940, as group executive of the Chemicals Section, Materials Division, Advisory Commission to the Council for National Defense, Dr. Morgan was chemical consultant for Scudder, Stevens & Clark of New York. Formerly he was associated with Loomis, Stump & Banks, consulting chemical engineers, as a partner.

♦ G. A. LUX, formerly research associate for American Electroplaters' Society at the National Bureau of Standards, Washington, D. C., is now development engineer, Divine Brothers Co., Utica, N. Y.

♦ M. C. VAN GUNDY, formerly assistant technologist, the Texas Co., is now sales engineer, Maintenance Engineering Co., Houston, Tex.

♦ J. W. RAYNOLDS, of Easton, Pa., who has served as assistant branch chief, has been appointed deputy director of the Chemicals Division of WPB. Mr. Raynolds was formerly associated with Mellon Institute at Pittsburgh.

♦ HUGH HUGHES, of Bloomfield, N. J., has been appointed assistant to director of the Commodities Bureau of WPB. He was formerly chief of the Aromatics and Intermediates Section.

♦ ROBERT T. HASLAM, general sales manager, Standard Oil Co. of New Jersey, has been named a director of the company.

♦ IRENE MOORE has been appointed to the faculty of the Pratt Institute of

Science & Technology, Brooklyn, N. Y. Mrs. Moore is the first woman to become a faculty member of the school. She is the wife of Mark B. Moore, of the Institute's mechanical engineering department. She will be an instructor in the department of chemical engineering, training women as chemical engineering aids in war industries.

♦ RUELL C. STRATTON, a major in the Chemical Warfare Service, Office of Chief of Ordnance, Safety & Security Branch, Chicago, Ill., has been made general chairman of the executive committee, Chemical Section, National Safety Council.

♦ PATRICK M. MALIN, former associate director of the Export-Import Price Control Office of the OPA, has been appointed price executive of OPA's Chemicals and Drugs Price Branch.

♦ PAUL L. BARNES, who was formerly associated with Arno W. Nickerson, consulting chemical engineer of New York, is now with the Chemical Warfare Service. Captain Barnes is stationed in New York.

♦ M. H. BIGELOW, of the Plaskon Co., was recently commissioned a captain in the United States Army. Dr. Bigelow reported for active service with the Chemical Warfare Service at Edgewood Arsenal.

♦ FRANKLIN R. FETHERSTON, who for the past 15 years has served as secretary and treasurer of Compressed Gas Manufacturers' Association has been granted a leave of absence to assume active duty in the army. Major Fetherston has been assigned to the Resources Division, Service of Supply.

♦ R. R. Williams, director of chemical research for Bell Telephone Laboratories, is coordinating research work being done on rubber for the director of rubber branch of WPB.

♦ DUNCAN MACRAE, chief chemist at Edgewood Arsenal, has been sent to Evanston, Ill., to be connected with the National Defense Research Committee.

♦ ROY A. SHIVE, of Calco Chemical Division of American Cyanamid Co., has been called to Washington by Rubber Reserve Co. to supervise production and development of chemicals for synthetic rubber.

♦ W. W. SKINNER, long associated with the Bureau of Agricultural Chemistry and Engineering, has been named chief, filling the vacancy caused by the death of Dr. H. G. Knight.

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Esse E. Routh

♦ ESSE E. ROUTH has been elected vice president and director of sales of Mathieson Alkali Works. He succeeds John A. Kienle, who has retired. Robert J. Quinn has become assistant to the vice president. D. W. Drummond has been appointed general manager of sales.



Charles A. Thomas

♦ CHARLES A. THOMAS, director of the Central Research Department and Osborne Bezanson, vice president and general manager of the Texas Division of Monsanto Chemical Co., have been elected to the board of directors of the company.

♦ WILLIAM B. PLUMMER, manager of the development and patent department of Standard Oil Co. of Indiana, has been commissioned a lieutenant-colonel in the U. S. Army for special duty in the office of the Under Secretary of War. Mr. Plummer saw service as a second lieutenant in World War I. He later was graduated in chemical engineering and took a master's degree in organic chemistry at Massachusetts Institute of Technology. In 1930, he joined Standard Oil as a chemical engineer to study the hydrogenation process. He became assistant manager of the development and patent department in 1935 and has been in charge of that department since 1938.

While Mr. Plummer is on leave of absence in the armed forces, Pike H. Sullivan, assistant manager of the development and patent department, will be manager.

♦ CALVIN YORAN, until recently associated with the Featheredge Rubber Co., Chicago, has joined the staff of the research laboratory of Wishnick-Tumpeer as chief chemist.

♦ G. F. Hogg, manager of the Chicago office, naval stores department of Hercules Powder Co. and Robert L. Skov, San Francisco representative for the naval stores, synthetics and cellulose products departments, have been transferred to its Hercules, Calif., plant. Mr. Hogg, who will serve as technical assistant superintendent at Hercules, will first spend a month at the Parlin, N. J. plant. Mr. L. P. Killilea, a naval stores department salesman attached to the New York office, will replace Mr. Hogg as acting manager in Chicago. Mr. Skov has been transferred to the engineering department at Hercules, Calif. He has been replaced for the duration by David M. Houston, assistant director, export department, Wilmington, Del.



The Vladimir N. Ipatieffs

♦ PROF. and MRS. VLADIMIR NIKOLAEVICH IPATIEFF were guests of honor at a dinner given by the American Institute of Chemists of Chicago, on November 20, in celebration of the professor's 75th birthday, his 50th year in chemistry, and their golden wedding anniversary. Professor Ipatieff is director of chemical research for the National Oil Products Co., Chicago.

♦ ARTHUR B. LAMB of Harvard University has received the 1943 William H. Nichols Medal of the New York Section of the American Chemical Society. Professor Lamb, for 25 years editor-in-chief of the *Journal of the American Chemical Society*, was cited as an authority on inorganic chemistry, as an investigator and administrator who has earned a permanent place of honor in the world of science,



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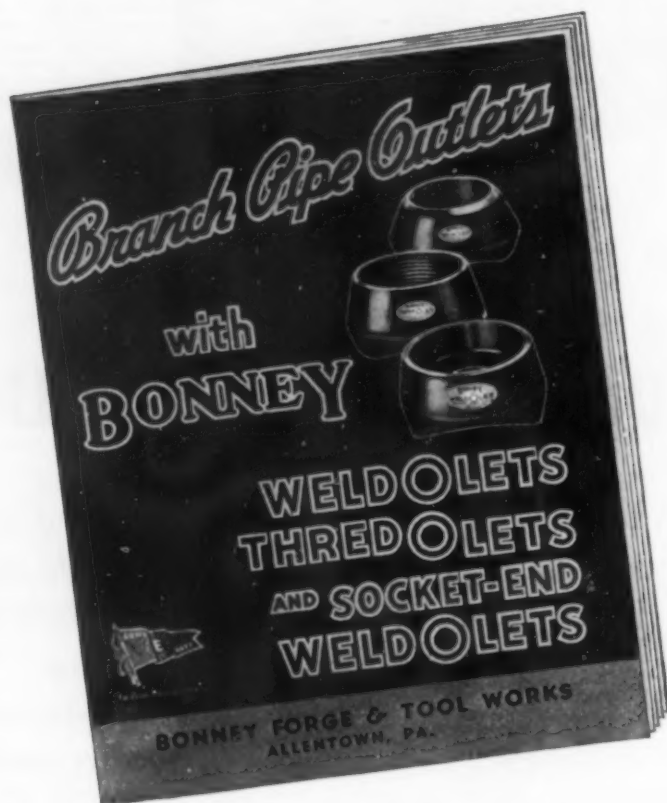
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and particularly for his research into the properties of the aquo and amonio-metal salts.

♦ H. W. FISHER has been made manager of a new department of the Standard Oil Co. of New Jersey (Del.) known as the Chemical Products Division. Mr. Fisher who had been manager of the commercial department of Standard Oil Development Co. since 1936 and vice president of Standard Alcohol Co. for the past four years, started in the research laboratory of Standard Oil Co. of Louisiana in 1927. He was transferred to Bayway two years later and moved to New York as assistant manager of the sales engineering department in 1933. Two years later he was made assistant director of the Esso Laboratories at Bayway.



Loren Dickerson

♦ LOREN DICKERSON, a member of the staff of Arthur D. Little, Inc., Cambridge, Mass., is one of the 28 new members recently elected to membership in the 200 Associates of Phi Beta Kappa, the national scholastic honorary society. The Associates were formed in 1940 to lead Phi Beta Kappa which now has over 90,000 members into a more active participation in present world affairs. Mr. Dickerson who is 24 is the youngest member of the Associates and the only chemical engineer in the group. He received a bachelor of science degree from Emory University, Atlanta, Ga., and will soon receive a doctor of science degree from Massachusetts Institute of Technology, where he studied a phase of fluid flow now used in research by the armed services. Mr. Dickerson is now engaged in chemical engineering research on war production facilities.

♦ J. LEVERT KIMBALL has become associated with the Bakelite Corp. in its Research and Development Laboratories, Bloomfield, N. J. He is a graduate of Mississippi State College and has a bachelor of science degree in chemical engineering.

♦ J. C. WILLIAMS, an alumnus of Oberlin and Iowa State College has

been appointed to the fellowship recently established by the Hawley Products Co., St. Charles, Ill. at Mellon Institute. The fellowship was established by the company for the purpose of conducting an investigational program of importance to our armed forces. Dr. Williams will be assisted by Peter Shanta, a chemical engineer from the University of Pittsburgh.



Harold Boeschstein

♦ HAROLD BOESCHSTEIN, president and general manager of the Owens-Corning Fiberglas Corp., Toledo, Ohio, has been appointed director of the Controlled Materials Plan Division and chairman of the Controlled Materials Board of WPB. Mr. Boeschstein was born in Edwardsville, Ill. in 1896. Following graduation in 1920, from the College of Commerce and Business Administration of the University of Illinois, he began his business career with the Edwardsville Bank & Trust Co., subsequently transferring to the operating department of the Illinois Terminal Railroad Co. at Alton, Ill. Less than two years after his graduation from college, Mr. Boeschstein became manager of an affiliate of the Illinois Glass Co., his first connection with the business in which he has remained ever since. His home is in Perrysburg, Ohio.

♦ C. A. MURRAY, formerly associated with Central Soya Co., Decatur, Ind. and previously employed by the Jackson Laboratory of the du Pont company, is now refining oil for the Reichhold Chemicals, Inc. Among the others recently appointed to the staff of Reichhold is Arthur C. Lansing, who spent 20 odd years in the chemical industry both in the laboratory and in the factory. Mr. Lansing is specializing in alcohol and fermentation processes for Reichhold. Clinton A. Braidwood came to Reichhold from U. S. Rubber Co. He is now engaged exclusively in synthetic rubber research and production. Charles J. Windsor, for many years in business as owner of the Windsor Products Co., is now the head of Reichhold's Chemical Control Division at their Detroit plant. Charles B. Breedlove, recently graduated from Purdue Uni-

Speed up construction with these new quick-setting

ACID-PROOF CEMENTS



Acid-proof masonry can be ready for use within 24 to 36 hours after the last brick is laid, with U.S. Stoneware's "Vitric-10"—the remarkable quick-setting, chemical-hardening cement.

"Vitric-10" is resistant to all mineral acids, salts, solvents and hydrocarbons (hot or cold), with the one exception of hydrofluoric acid. "Vitric-10" possesses strong bonding and adhesive properties; is highly resistant to abrasion; is unaffected by abrupt temperature changes; and is simple to handle.

Acid-proof masonry is built entirely from non-critical materials. In addition to its instant availability, acid-proof masonry offers other very definite advantages for chemical plant construction: (1) Its initial cost is low; (2) properly installed, the maintenance cost is practically nil; (3) solution contamination is non-existent; (4) acid-proof masonry operates perfectly

at high temperatures or under abrupt temperature changes.

OTHER U. S. STONEWARE CEMENTS

In addition to "Vitric-10", U.S. Stoneware manufactures other highly specialized cements, including:

"Pre-Mixt"—requires only the addition of water.

"Portite"—sulphur base heat-and-pour type cement.

"Vitric" Fire-proof cement — for acid conditions continuously above 500 degrees F.

"Duralon"—a new synthetic resin cement, completely non-porous with high compressive and tensile strength.

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AKRON, OHIO

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LICK **CORROSION PROBLEMS** with **HOMESTEAD LEVER-SEALD** **PLUG VALVES**

Hot caustic and frequent operation are tough service conditions; but the 2" and 3" Homestead Lever-Seald Valves used throughout this prominent plant lick them with long, low-cost, trouble-free service.



Valve troubles caused by corrosive or viscous fluids CAN be overcome . . . by using the RIGHT valves! Homestead LEVER-SEALD Plug Valves were designed to lick the problems of the processing industry . . . corrosion, viscosity, temperature, pressure, operating frequency and similar trouble makers.

Built into each of these valves is a powerful leverage (lower lever on the valves shown), which relieves seating pressure between plug and body just enough to overcome friction and permit easy turning. Then a quarter turn of the upper lever fully opens or closes the valve; and full seating pressure is again applied to the lower lever to make a positive, leakless seal. Thus, right on each Homestead Lever-Seald Valve is the mechanism which makes possible unfailing "stick-proof" operation.



Additional features, invaluable to processing, include seating surfaces protected in all positions; straight-through flow that minimizes pressure drop; positive sealing without contaminating lubrication; sealed bottom and deep stuffing box to prevent hazardous leakage. Available in sizes from 1 1/2" to 10" for pressures from 150 to 1500 lb. and metals matched to service requirements. Write for Valve Reference Book No. 38.

HOMESTEAD VALVE MFG. CO.

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versity in chemical engineering, is now working in the sales service laboratory.

♦ **EARL B. BUSENBERG**, chief chemist of the Philadelphia Rubber Works Co., Reclaim Division of The B. F. Goodrich Co. has been loaned to the government to serve on the staff of technical consultants assisting William M. Jeffers, U. S. Rubber Director. Mr. Busenberg will devote himself to the technical phases of reclaimed rubber. He joined the Philadelphia Rubber Works Co. in its general laboratories in 1922 after studying chemistry at the University of Akron. Mr. Busenberg was promoted to chief chemist in 1929.

♦ **WALTER SAVELL**, formerly of Mathieson Alkali Works is now a lieutenant colonel in the Chemical Warfare Service. Mr. Savell has three sons in the armed forces.



Seymour Faulkner

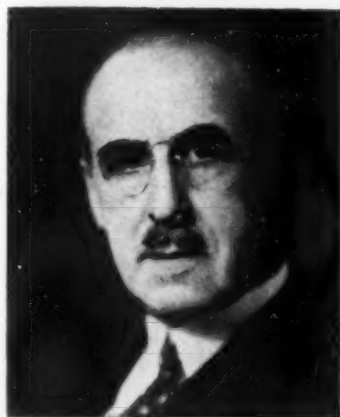
♦ **SEYMOUR FAULKNER**, who for the past year has been doing consulting engineering work for the Girdler Corp., has now joined the staff to direct the development and further the sales of certain new processes and catalysts to be used in gas, chemical and other fields. Prior to 1941, Mr. Faulkner was associated with Procter & Gamble Co., Cincinnati, Ohio, for more than 15 years. While there he worked for a time in the research department on catalysts and hydrogenation problems and was later transferred to the development department. For eight years he was in charge of development section of Procter & Gamble's business pertaining to new processes and improvements in the fields of hydrogen and water gas manufacture and purification, catalysts, hydrogenation and other subjects.

♦ **HOWARD F. SHENTON** left his position on the staff of Sheppard T. Powell as consultant to the design department of the Tennessee Valley Authority to accept a position as chemical engineering assistant to the production manager of Agfa Anso Division

of General Aniline & Film Corp., Binghamton, N. Y.

♦ LLOYD H. WARTMAN is now with the Research and Development Laboratories of the Bakelite Corp., Bloomfield, N. J. Mr. Wartman is a graduate of the College of St. Thomas.

OBITUARIES



Frederick M. Becket

♦ FREDERICK M. BECKET, formerly president of Union Carbide & Carbon Research Laboratories, and vice-president of Union Carbide Co., Electro Metallurgical Co. and Haynes Stellite Co., died December 1 in Roosevelt Hospital in New York. He was 67 years of age.

Dr. Becket was born in Montreal. He graduated from McGill University in 1895. The next year he came to the United States, and graduated from Columbia University with a master's degree in 1899. In 1929 he received the honorary degree of doctor of science from the same university. McGill made him a doctor of laws in 1934. For his achievements in metallurgy Dr. Becket received the Perkins Medal, the Elliott Cresson Medal, the Acheson Medal and a Modern Pioneers Award. He was president of the Electrochemical Society in 1926, of the American Institute of Mining and Metallurgical Engineers in 1933, of the Chemists Club in 1939.

♦ BENNET B. BRISTOL, who with his brother, Edgar H. Bristol, founded the Industrial Instrument Co. in 1908, which later became the Foxboro Co., died at his summer home at Falmouth Heights, Mass., on November 10 following several months' rest from a heart attack suffered last May. Mr. Bristol was born in Naugatuck, Conn., May 3, 1868. In 1893 he was graduated from Stevens Institute of Technology. Throughout the history of the Foxboro Co. he served as its treasurer and clerk. He was president of the Foxboro National Bank, a director of the Citizens and Manufacturers National Bank of Waterbury, Conn., chairman of the board of trustees of the Fox-

WHAT YOU SHOULD KNOW ABOUT PIPE HANGERS!

There is no place for guesswork in the selection of Pipe Hangers. The following excerpts from the American Standards Association Code for Pressure Piping give time-proved guidance to correct procedure.

MALLEABLE IRON CASTINGS may be used for pipe clamps, beam clamps, hanger flanges, clips and bases, swivel rings and similar parts of pipe supports, but their use shall be limited to such cases where the operating temperature of the pipe line will not be in excess of 450°F.

STEEL or WROUGHT IRON can be used throughout for hanger rods, turnbuckles, beam clamps, pipe clamps, supports, rollers, guides and bases.

GRINNELL offers an ENGINEERED PIPE HANGER

for each specific service . . .

MALLEABLE IRON ADJUSTABLE SWIVEL RING (Split Ring Type) - Underwriters Approved - Patented. Can be used with coach screw rod or machine threaded rod with practically any type of ceiling flange, expansion case, or insert. Swivel shank allows adjustment. No temporary support of pipe line is needed while making adjustments. Swivel shank locks automatically when pipe is in desired position. The hinging of the ring is off center, providing sufficient seating to hold the pipe before closing the ring.



WROUGHT STEEL ADJUSTABLE PIPE CLAMP - Underwriters Approved. Consists of two half-bands bolted together with Weldless Eye Nut and Bolt. When used with U.F.S. I-Beam Clamp with Weldless Eye Nut, provides for at least 3 inches of horizontal pipe movement in any direction per foot of hanger rod length.



For complete details, write for catalog of Grinnell Adjustable Pipe Hangers and Supports. Grinnell Company, Inc., Executive Offices, Providence, R. I. Branch offices in principal cities of United States and Canada.

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WHENEVER PIPING IS INVOLVED

Make Stainless Steel *Go Farther!*

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Awarded for outstanding production achievement.

One plate of stainless steel if rolled into a plate of Jessop Silver-Ply Stainless-Clad Steel (20% cladding), will make available 5 times more stainless surface.

Use of 5% to 50% Silver-Ply Stainless-Clad Steel conserves strategic alloys for the war effort . . . and you still have the desired protection of stainless steel on the clad side, strength from the mild steel backing and better thermal conductivity. It also economizes on material costs with savings up to 45% as compared to solid stainless.

If your operations involve processes where corrosion of equipment must be avoided and product purity must be maintained, Silver-Ply Stainless-Clad Steel may solve your problems, for it is corrosion resisting, stain-free and easy to clean.

Write for descriptive booklet listing applications for processing and storage equipment for use in your specific industry.

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boro State Hospital, and took an active interest in the affairs of his church and community.



Alexander Lowy

♦ ALEXANDER LOWY's portrait by Norwood MacGilvary was presented to the University of Pittsburgh at a memorial ceremony October 30. The painting of the portrait was made possible by the chemistry alumni, faculty and students of the University of Pittsburgh. Dr. Wilmer E. Baldwin, assistant professor of chemistry, presided as chairman of the memorial committee. Prof. Alexander Silverman made the presentation address and the portrait was received by Chancellor John Gabbert Bowman.

♦ FREDERICK VAN VOORHEES LINDSEY, vice president and general sales manager of the Driver-Harris Co., Harrison, N. J., died November 16 at Memorial Hospital, New York City, after a brief illness. Mr. Lindsey was born in Streator, Ill., but resided in Chicago until 1916 when he moved to Morristown, N. J., where he became associated with the Electrical Alloy Co., as vice president and general manager. In 1925, when the Electrical Alloy Co. was absorbed by the Driver-Harris Co., he was elected vice president and general sales manager.

♦ WILLIAM SALT, for many years head of the service department of the De Laval Steam Turbine Co., died suddenly on October 31. Mr. Salt was one of the oldest De Laval employees in point of service, having been associated with the company for more than 40 years.

♦ NATHANIEL PALMER PRATT, one-time president of Georgia School of Technology, died November 15 in a hospital in Atlanta. His age was 84. He had been ill for the past two weeks. He was founder of the N. P. Pratt Labora-

tory for analytical and technical chemistry. Dr. Pratt's father was a scientist and engaged in the manufacturing of explosives for the Confederate Government at Augusta, Ga., during the War Between the States.

♦ FRANCIS HERVEY PAYNE, president of American Meter Co. and manager of the corporation's Metrie Metal Works plant at Erie, Pa., died suddenly November 10 while attending the monthly meeting of the Men's Club at St. Paul's Church, Erie, Pa. He was 75 years old. Mr. Payne was born April 1, 1868, at Petroleum Center, Pa., where his father, the late Calvin N. Payne, was engaged in drilling for oil and built the first natural gas pipe line in America.

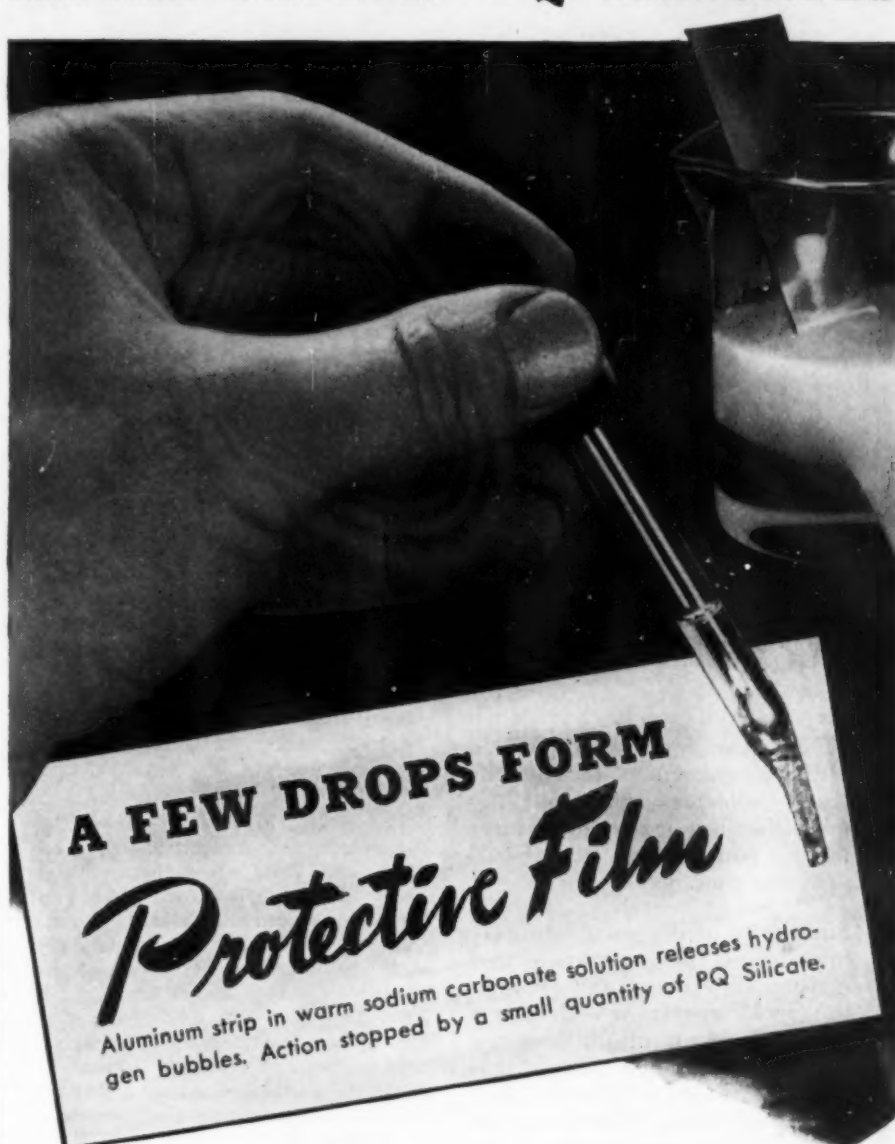
♦ FRANK J. WESCHLER, vice president of the Chain Belt Co., Milwaukee, and general manager of Baldwin-Duckworth, a division of Chain Belt Co. at Springfield and Worcester, Mass., died suddenly on November 10 in Worcester. Mr. Weschler had been exceedingly active in the industrial life of Springfield, and Worcester, Mass.

♦ A. B. GERBER, chief chemist of the Trenton, Mich., plant of Monsanto Chemical Co., died suddenly November 22 from a heart attack. He was 50 years old.

♦ HARRY J. SCHNELL, president of the Schnell Publishing Co., New York, and editor and publisher of Oil, Paint and Drug Reporter and National Painters Magazine, died unexpectedly November 29 in the Orange Memorial Hospital, Orange, N. J. He had been under observation by his physician for a week. Mr. Schnell was 67 years old and for 52 years had been associated with the publications of which he became owner in April, 1941. He served long as a trustee and for two terms as president of the Village of South Orange where he resided from 1910 until his death. He also was a trustee of the New Jersey College of Pharmacy.

♦ PAUL B. SEYDEL, a partner in the firm of Seydel, Woolley & Co., Atlanta, Ga., died recently in a private hospital, following an operation a week before. A native of Brussels, Mr. Seydel came to this country soon after he was graduated from the University of Brussels; with a brother, Herman, he founded the Atlanta Compound Co., which moved to Jersey City in 1909 and became the Seydel Manufacturing Co. In 1921 the brothers purchased the old World War plant at Nitro, W. Va., and Paul Seydel took active control of the new firm that manufactured dye intermediates, heavy chemicals, benzoic acids, pharmaceutical supplies. Two years later he returned to Atlanta and with Vasser Woolley, Sr., he organized the Seydel, Woolley & Co., manufacturers of textile chemicals.

METAL SAVERS—PQ SILICATES



METAL shortage calls for metal saving—adding longer life to what you have. PQ Silicates fit into your conservation program by helping in these important ways:

Cleaning: Equipment of all sorts made of aluminum, tin, copper or some alloy metals, soft metal parts are cleaned safely with PQ Silicate Detergents.

Corrosion Inhibitor: Water Pipes: PQ Silicates protect iron and galvanized pipe. Process applicable

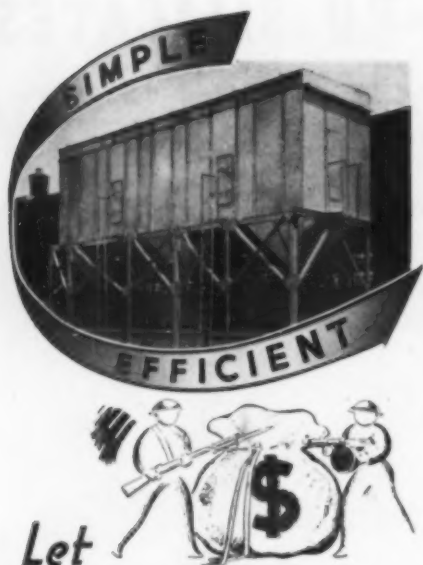
for industrial or municipal systems, for hot or cold water lines. Salt Brine Lines: Corrosion of steel pipe, carrying oil well brines, prevented by PQ Silicate treatment.

Castings: Porous metal castings can often be salvaged by immersion in dilute PQ Silicate or by pumping the silicate under pressure.

Present your problem to us. We're ready to help you to solve it by suggesting the proper grade of silicate to use and how to apply it. Request Bulletin 17-1.

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THE simplicity of design and high efficiency of Dustube Dust Collectors offer you the two most important advantages in dust control, and BOTH will save you money.

Simplicity of design means easy installation, low operating and maintenance costs, and "round-the-clock" operation with only a minimum of attention. You can get an idea of how simple this collector really is from the fact that it takes less than a minute to install or remove one of the dust tubes.

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HIGH EFFICIENCY
DUST COLLECTORS

NEWS OF PRODUCTS AND MATERIALS

CHEMURGIC SYNTHETIC RUBBER

Production of a new chemurgic synthetic rubber, based on soy bean oil, and a low content of ethyl alcohol, has been announced by Reichhold Chemicals, Inc., Detroit. The trade name is Agripol. It is said to be capable of replacing natural rubber in 15 percent of all uses to which rubber has heretofore been put. Like other "static" synthetic rubbers, it is chiefly valuable for molded products where high tensile strength and great elongation are not essential. In its present state it is not suitable for tires or other uses requiring resistance to heat and friction. The present production of Agripol is 125 tons a month, by February it is expected to be 1,000 tons a month, and by May 2,000 tons. Its flexibility at low temperatures, minus 40 deg. F. and less, is said to be approximately equivalent to natural rubber for all practical purposes. In aging tests its behavior is superior. It is less susceptible to attacks by the elements. In resisting oxidation it greatly surpasses natural rubber.

RESIN REPLACES RUBBER

Raincoats, bags for transporting drinking water, hospital sheeting, life rafts and belts, food bags, waterproof and oil-resistant suits and surgical plaster will be made from a fabric coated with Butacite, polyvinyl acetal resin, instead of rubber, according to an announcement of E. I. du Pont de Nemours & Co., Wilmington, Del. This plastic coating is lighter than rubber and equals it in wear resistance. Developed as a substitute, chemists are predicting that because of its superiority for special uses it will replace rubber as a coating material for some fabrics, even when rubber is again plentiful.

DRYING OIL SUBSTITUTES

America need no longer depend wholly on foreign sources for the fast-drying oils so necessary to the modern paint industry. Each of several domestic oils can now be separated into two or more fractions that differ greatly from each other in their physical properties. Some of these domestic oil fractions may be used to substitute directly or in a large part for the foreign oils, which have been imported from the Far East. This important development, which extends the usefulness of domestic products in paint, food and other industries, is the result of seven years of research work by the Pittsburgh Plate Glass Co. The process that they have developed can be used in general to produce tailor-made fractions of the natural oils in fats for specific purposes. Since a good part of the 11,000,000 lb. annual United States consumption of oils and fats may be made more useful by this development, the implication of the

process takes on a new meaning. Already limited commercial production has been successful, and a new plant nearing completion will be capable of operating on any of the natural oils. The company proposes to use the first unit for fractionating linseed oil in order to provide replacement for channel wood and perilla oil.

SOLID FIBER

A new solid fiber designed for packaging of war materials instead of corrugated paper has been developed by The Southern Kraft Division of International Paper Co., New York. This new material insures dry content even when submerged in water for two or three hours, and similarly will stand more abuse and hard usage than corrugated paper stocks. It is proposed to continue the production of the new solid fiber after the war for use as a paper-board building material and other kindred service.

GEM-QUALITY SYNTHETIC CORUNDUM

Synthetic white sapphire, the mineral corundum unpigmented and of gem quality is now available in the form of boules from the Linde Air Products Co., New York, N. Y. The boules, the form in which the sapphire is manufactured, each weigh at least 150 carats and are of a regular cylindrical shape, enabling gem cutters to standardize on cutting and sawing procedures. The material as now made, is practically perfect, any imperfections being microscopic in size and having no effect whatever on the quality of the material for precision-bearing surfaces and other essential industrial parts.

LUBRICANT AND COOLANT

A concentrated base which when mixed with light or medium petroleum oil provides an excellent machinery coolant and lubricant for very difficult jobs on aluminum, particularly silicon alloys. It is known as Quaker A.M. Base No. 11 and is a product of Quaker Chemical Products Corp., Conshohocken, Pa. and gives exceptional finish. Its lubricity and EP values are not diminished by dilution with light petroleum oil such as mineral seal oil used to achieve maximum wetting and cooling properties.

HIGH-MELTING SYNTHETIC WAX

A new synthetic wax made entirely from domestic raw materials that are freely available is known as Durocer and made by Glyco Products Co., Brooklyn, N. Y. The wax is dark tan in color, has a melting point of 120 to 127 deg. C. and is almost as hard as carnauba wax. It is soluble in hot toluene, naphtha, turpentine and oils. Solutions form gels on cooling. It is of considerable interest in the manufacture of insulating wax, record



POMONA PUMPS STRETCH YOUR PUMPING DOLLAR

MAKE THE MOST OF PLANT SPACE

Pomonas Require only a Fraction the Space of Other-type Pumps



SAVE SPACE ON LOCATION: Check over your Pomona installation. It may be that it was simply set into the area occupied by your former pump with little thought given to maximum space utilization. Can you move your Pomona to an out-of-the-way corner—or into a space too small for other equipment—and thus gain added floor space for new equipment?

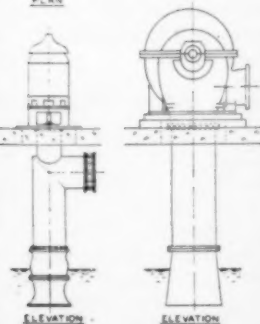
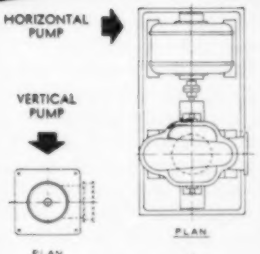
USE TOP-OF-TANK SPACE NOW WASTED: If your Pomona is not now located over the sump or tank from which it pumps, why not put it there? This space is generally wasted with other-type pumps because of their excessive weight and the difficulty of setting rigid foundations—in fact, But Pomonas need no heavy foundations—just two timbers anchored across the top of the sump is usually sufficient support for these compact self-balanced pumps. So by relocating your Pomona over the sump or tank, you can gain solid floor space for other heavy-duty purposes.

ELIMINATE SPACE-WASTING PIPING: Another important way you can save space with Pomonas is by running all piping either below floor level or overhead, thus leaving the floor space open. You can do this with Pomonas far more easily than with other types because their positive-lift characteristics eliminate need for a fixed level discharge in relation to pump position.

UTILIZE REMOTE LOCATIONS: Still another important space-saving feature of Pomonas is that the impellers are at water level and require no priming to start. This not only eliminates space-consuming priming equipment but—even more important—enables you to place Pomonas at remote out-of-the-way locations and operate them automatically with only infrequent attention. That leaves more floor space free in the center of the plant for equipment that requires the operator's constant attention.

HORIZONTAL PUMP

VERTICAL PUMP



Pomonas Use 1/5 The Space—Weigh Half As Much!

The drawings at left, both the same scale, show how a Pomona Vertical compares with a horizontal centrifugal handling identically the same capacity and head. Note the floor space required—30 sq. ft. for the centrifugal, 14 for the Pomona—a direct saving of 53%.

Notice the simple, compact lines of the Pomona compared with the higher, heavier, more complicated centrifugal. Note the Pomona below-floor discharge, leaving the surface around the pump clean and pipe-free. (Pomona discharge can also be at, or above floor level.) And notice in chart below how the Pomona not only saves 53% of the floor space, but weighs only about half as much—with fewer parts to service. These are the kind of dollar-saving, space-saving features you Pomona owners have in your pump. See them to full advantage!

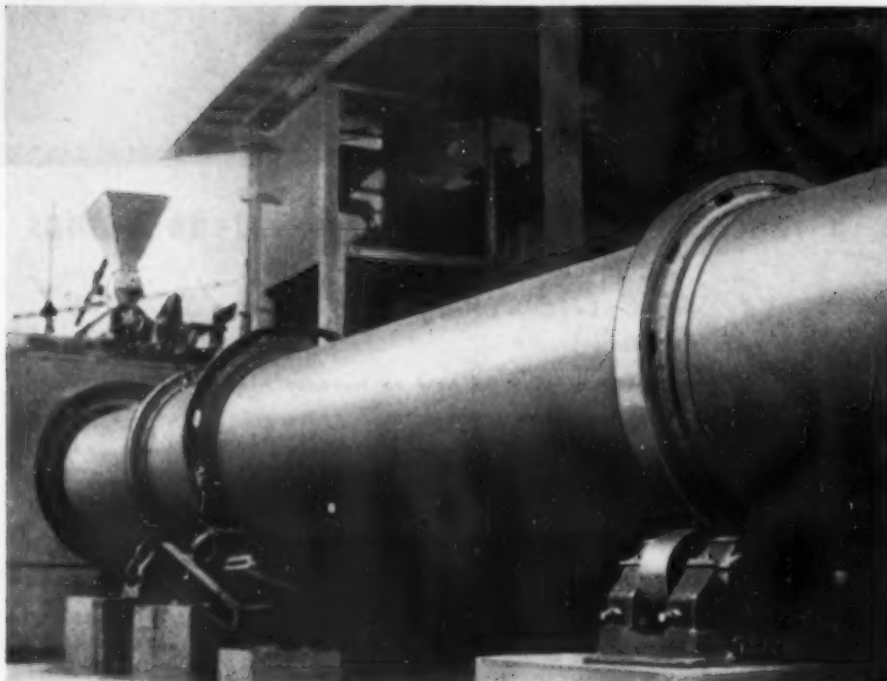
These are only a few of the many ways you can save valuable plant space with Pomonas. Have your nearby Pomona dealer check your installation to see how you can get maximum benefit from the space-saving features in Pomonas. Call him today.



POMONA PUMP CO., 320 Broadway, New York City
Plants located at 4201 South Spring Avenue, St. Louis, Missouri, and 304 Commercial Street, Pomona, California

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PLANTS
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ROTARY COOLERS
ROTARY DRYERS

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BULLETIN
115

IT happens quite frequently, when the engineers of chemical and process industries are working out a new development, that they consult with our technicians as to the most efficient methods and equipment for burning, cooling and drying. They have learned through their own experience, and that of others, that Traylor Rotary Kilns, Coolers and Dryers are not mere units of mechanical equipment, but machines having built-in knowledge of results to be attained. They know that by using Traylor Equipment they will be able to work out their processes, successfully, quickly, masterfully.

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SOLUBLE CUTTING COOLANT

A special and unique type soluble cutting coolant for aluminum sand castings, zinc and aluminum die castings and soft metal alloys is Quaker A.M. Base, a product of Quaker Chemical Products Co., Conshohocken, Pa. It is mixed with water for application, in which it instantly emulsifies in all proportions. This keeps the applied cost low while providing high cooling power. The wetting and spreading action on aluminum is good and it has necessary lubricity to provide a fine finish.

DEHYDRATED INTERIOR FLAT PAINT

"Why ship water from Natchez to Nashua?" reasonably inquires Devoe & Reynolds Co., introducing a new interior flat paint from non-critical materials, packed in non-critical containers, dehydrated for economy and efficiency in shipping. As new and as compact as V-Mail, Dehydray saves space for the railroads, metal for the government, money for the consumer. In concentrated paste (glass packed) or completely dehydrated powder form, Dehydray mixes readily with water, enables the housewife to paint quickly, easily, inexpensively, over wallpaper or other wall surfaces, after drying 30 days meets washability requirements of U. S. Government Specification TT-P-88 for emulsified resin paints. A 3½ in. cubical cardboard carton of Dehydray dissolved in water makes a full quart of paint.

STICK-TO-METAL GUMMED LABELS

One of the reasons labels have never found great adaptability in plants producing metal products has been due to the fact that ordinary gumming does not adhere to metal surfaces. However, after careful laboratory experimentation, there has been developed a special "stick-to-metal" gumming. This gumming can be applied to either paper or linen fabric upon which any message can be printed or written.

The Ever Ready Label Corp., New York, N. Y., in the past few months has produced many labels for some of America's largest industrial plants. They use "stick-to-metal" gumming on tools, products and machines. Stickers carry inspection data, instructions, warnings, etc., while plain gummed labels are used mostly in office procedure for routing, scheduling, tabbing, etc.

ANHYDROUS SODIUM METASILICATE

The manufacture of anhydrous sodium metasilicate at Chester, Pa., and Anderson, Ind., plants has been announced by the Philadelphia Quartz Co., Philadelphia. This product is called Metso anhydrous, latest member of their line of Metso cleaners. It is a technical grade of anhydrous sodium metasilicate, Na₂SiO₃, without water of crystallization.

White and free-flowing, the anhy-

drous metasilicate is specially sized to reduce dustiness and to permit ready solubility. Of primary interest to fabricators of cleaning compounds for special purposes is its compatibility with soap, wetting agents, and other alkalis, such as caustic soda and phosphates of soda. Commercial quantities are now being packed in wax-lined barrels and fiber drums.

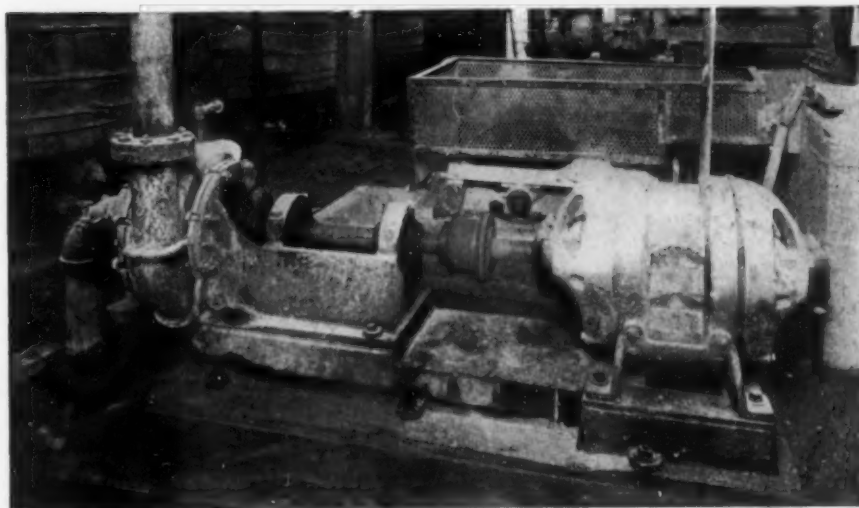
NICKEL FOIL

Production on a small scale of pure nickel foil has been started by the Chromium Corp. of America, Waterbury, Conn. The new foil, which is produced by electrolysis, is at present obtainable in widths up to 16 in., in thicknesses from 0.00025 in. to 0.0015 in., and in indefinite lengths. Foil in widths as great as this, and so thin, has not hitherto been available, and it is hoped that it will find a use for war purposes where thicker foil has previously been used, or where piecing out with narrower foil has hitherto been necessary.

The foil as produced, is fairly stiff, but is not brittle. It will stand moderate deformation as is, but can be annealed if a softer material is required. It may be welded or soldered, and can be plated with other metals, or bonded to wood, plastics and other metals. Because of the availability for the first time in these dimensions of a material with the chemical and physical properties of nickel, it is expected to be of interest in chemical, electrical and construction industries. It should find application as a lining for containers, in radio and telephonic equipment, as a diaphragm, and as a wrapping, among other possible uses.

PIGMENT SUSPENSION AGENT

A powerful suspension agent is an important factor in the successful manufacture of blackout paint. These luminescent paints cannot be ground without impairing their efficiency. As a consequence the pigments are usually coarser in texture than pigments ordinarily used in protective paints. This particular characteristic tends to bring about excessive settling or caking of the pigment in the bottom of the container in storage unless proper precautions are taken. In tests conducted in the laboratory of the Metasap Chemical Co., a subsidiary of National Oil Products Co., Harrison, N. J., and in sample batches in pilot plants, a product was developed as a pigment suspension agent which proved very successful, it is said. It has been found that good results were obtained when necessary amounts of this agent were mixed with the thinner while cold, then heated to about 180 to 200 deg. F. in a steam jacketed kettle until dissolved, and then pigment and vehicle added. The product is ideal for use in suspension of luminescent pigment because it may be used in high concentrations and because of its ability to form thick, supporting gels.

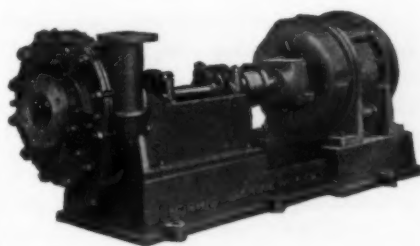


PUMPS BY MORRIS

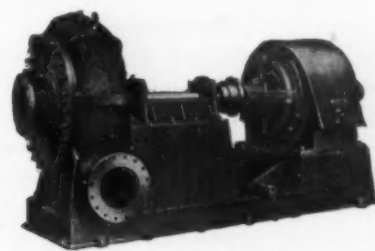
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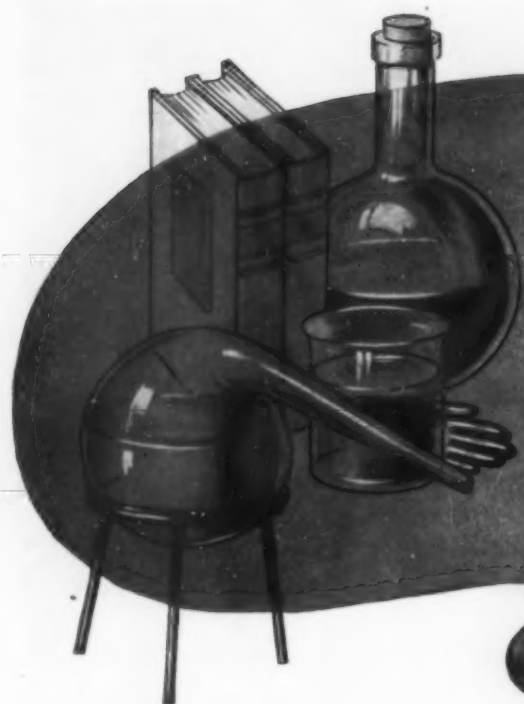
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RESEARCH CHEMICALS

These chemicals, developed by du Pont research, offer interesting possibilities for the production of new and essential materials.

SODIUM METHYL SULFATE (NaCH_3SO_4)

is a methylating agent. It should be of particular interest in methylating operations where convenient physical form, high solubility and lack of volatility are desirable. This product is available in sample quantities as a 50% aqueous solution. *Available in small quantities for experimental investigation only.*

SODIUM CHLOROSULFONATE (NaClSO_3)

is a finely divided crystalline powder which hydrolyzes rapidly to liberate hydrochloric acid. With the application of heat, the dry salt decomposes to yield chlorine and sulfur dioxide. It has possible use in the manufacture of materials in which sulfonation and chlorination reactions would be involved. The chlorosulfonates of calcium, magnesium, aluminum, iron, copper and lead can also be made available in sample quantities in case of special interest. *Available in small quantities for experimental investigation only.*

GLYOXAL SULFATE ($\text{SO}_4\text{CH-CHSO}_4$)

is a white crystalline powder soluble in the lower alcohols and ketones. It is also markedly soluble in water at somewhat elevated temperatures (about $50^\circ\text{C}.$) although slow decomposition takes place under these conditions. This material is of interest as a possible source of monomeric glyoxal, the simplest dialdehyde, which may be useful in reactions involving insolubilization and cross-linking.

Available in small quantities for experimental investigation only.

SULFUR PENTOXIDICHLORIDE ($\text{Cl-SO}_2\text{-O-SO}_2\text{-Cl}$)

is a straw-colored liquid boiling at $150^\circ\text{C}.$ It is only slowly soluble in cold water but reacts violently with water on warming. It is miscible with a variety of organic liquids and readily reacts with the ethylene linkages, hydroxyl groups and amine groups. Of interest is its possible use in the solubilization of petroleum, vegetable and fish oils. *Available in small quantities for experimental investigation only.*

ACID HYDROXYACETIC **70% Technical Grade** (HOCH_2COOH)

A synthetic organic acid (Glycollic Acid) derived from coal, air, and water by high pressure synthesis. Contains 30% water, plus a small quantity of impurities. Strength approximates that of lactic and formic acids. Non-volatile and readily soluble in water. Bifunctional, it exhibits the properties of both acids and alcohols. Uses: tanning of leather, dyeing of leather and textiles, metal treatment, acid dairy detergency, rubber coagulation, and organic synthesis. *Available in commercial quantities.*

ACID HYDROXYACETIC (Acid Glycollic) (HOCH_2COOH)

An organic acid derived from coal, air, and water by high pressure synthesis. Strength approximates that of lactic and formic acids. Non-toxic, non-volatile, readily soluble in water. Bifunctional, it exhibits the properties of both acids and alcohols. Suggested uses: acidification of foodstuffs, beverages, pharmaceuticals, cosmetics, and photographic chemicals. *Available in small quantities for experimental investigation only.*



BETTER THINGS FOR BETTER

Bennett Elected to Head Chemical Engineers

CHEMICAL ENGINEERS ELECT BENNETT PRESIDENT

THE AMERICAN Institute of Chemical Engineers has elected J. L. Bennett, manager of Chemical Operations, Explosives Department, Hercules Powder Co., Wilmington, Del., as president for the coming year. Other officers elected to serve with Mr. Bennett are George G. Brown, professor of chemical engineering, University of Michigan, vice-president; Stephen L. Tyler, New York City, secretary; and C. R. DeLong, New York City, treasurer.

Directors elected to serve for a term of three years each included: Lawrence W. Bass, assistant director, Mellon Institute; Barnett F. Dodge, head of the department of chemical engineering, Yale University; Chester L. Knowles, chemical sales director, Dorr Co., New York City; and Charles M. A. Stine, vice-president, E. I. du Pont de Nemours & Co., Wilmington, Del.

Mr. Bennett has spent his entire professional career in the services of Hercules Powder Co. He was supervisor of various chemical operations at Hercules' explosives plants in Missouri, Utah and California from 1914 to 1919, and from 1919 to 1933 he was engaged in the supervision of heavy chemical operations of the company's explosives department, making his headquarters in Wilmington. Since 1934 he has been manager of chemical operations of the explosives department.

Mr. Bennett was vice-president of the Institute during the past year, and he is a past chairman of the Philadelphia-Wilmington section. He succeeds Sidney D. Kirkpatrick, editor of *Chem. & Met. Eng.*, retiring president.

A.I.Ch.E. MAKES RECOMMENDATIONS FOR TECHNICAL MANPOWER CONTROL

THE AMERICAN Institute of Chemical Engineers, at its annual meeting in

J. L. Bennett, newly elected A.I.Ch.E. head



Cincinnati, November 16, subscribed to certain statements concerning the supply of engineering manpower and urged the adoption of its plan looking toward the assurance of the necessary supply of men trained on a professional level to perform engineering services in the armed forces and in war industries.

A copy of the findings and recommendations of the Institute, which are outlined below, has been sent by S. D. Kirkpatrick, president, to President Roosevelt and also to Dr. E. C. Elliot, Chief of the Professional and Technical Division, War Manpower Commission.

The situation now existing was found by the Institute to be essentially as follows: (1) War industries now need and will continue to need a steady replacement supply of technically trained men both for maintenance of mass production and for continued improvement of military material; (2) the supply of professional engineers of all kinds is wholly inadequate to meet the greatly increased requirements of the Armed Forces and of war production; (3) engineering schools must continue to be the major source of supply of young engineers and efforts to enroll women in engineering schools have not yet been successful to any significant extent; (4) effect of the new draft law will be to throw a considerable proportion of all engineering students into officer training programs and a large proportion of those who cannot qualify physically for officer training, into the draft.

In view of these facts, the Institute has decided upon the following recommendations: (1) That the loss of technically trained men from war production plants be stopped by cessation of voluntary enlistment or by a "freezing" order covering such personnel and plants; (2) that selective service occupational Bulletin No. 10 of last June be reaffirmed in principle in its provisions for the deferment of men in engineering training; (3) that this Directive be modified in the light of the lower draft age by providing for the deferment of engineering students in established colleges to the end of the term in which they reach the age of 18, and thereafter, on a term by term basis as long as their academic records remain satisfactory.

Present capacity of engineering colleges for entering students is about 40,000 per year. The number of young men reaching 18 is about 3,000 per day. Therefore, less than two weeks' supply of young men would be sufficient to insure a normal output of young engineers each year. On graduation, the number will have been reduced to about 18,000 and the other 22,000 will have been unsuccessful and inducted into the Armed Forces. Of the 18,000

CHEM
& MET

NEWS OF MEETINGS & CONVENTIONS

trained men, approximately one-half would meet the physical requirements for eventual commissioning and the rest would be available for war production industries.

As a final result the Armed Forces would lose the direct services of only three days' supply of those reaching age 18 each year. This small number, insignificant in the total manpower situation and, in the opinion of many, an absolute minimum for the vast production effort now contemplated, would go far toward insuring the maintenance of an acceptable level of engineering competence in war production.

A.I.M.E. ELECTS OFFICERS AND DIRECTORS

C. H. MATHEWSON, professor of metallurgy and chairman of the Department of Metallurgy, Yale University, has been elected president of the American Institute of Mining & Metallurgical Engineers for 1943. Also elected at the same time were two vice-presidents; Erle T. Daveler, vice-president, Utah Copper Co., and Harvey S. Mudd, consulting engineer, Los Angeles, Calif. The six directors elected were: H. J. Brown, consulting engineer, West Newton, Mass.; Charles H. Herty, Jr., assistant to the vice-president, Bethlehem Steel Co.; O. H. Johnson, vice-president, Mine & Smelter Supply Co., Denver, Colo.; Russell B. Paul, mining engineer, New Jersey Zinc Co.; F. A. Wardlaw, Jr., assistant manager, International Smelting & Refining Co.; and Felix E. Wormser, secretary and treasurer, Lead Industries Association.

Announcement was also made that the Lucas Medal for 1943 had been awarded to Dr. John Robert Suman, vice-president of the Humble Oil & Refining Co. of Houston, Tex. The medal was presented to Dr. Suman for his "distinguished achievement in improving the technique and practice of producing petroleum."

TECHNICAL VALUATION SOCIETY HOLDS ANNUAL FORUM

THE TECHNICAL Valuation Society, Inc., held its annual forum December 12 at New York, N. Y. The morning session was devoted to prominent economists, appraisers and valuation engineers who presented papers and di-



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rect discussions on many pressing valuation problems, particularly in their relation to the war effort. Following a luncheon with guest speakers, the afternoon session was devoted to committee meetings and the annual business meeting of the Society.

ELECTROCHEMICAL SOCIETY FORMS CORROSION DIVISION

AT THE FALL convention in Detroit during October the Corrosion Division of the Electrochemical Society was organized. At this meeting the by-laws were adopted and following officers were elected: chairman, L. G. Vande Bogart, Research and Development Lab., Crane Co., Chicago, Ill.; vice-chairman, H. H. Uhlig, General Electric Co. Research Lab., Schenectady, N. Y.; secretary-treasurer, R. H. Brown, Metallurgical Div., Aluminum Research Lab., Aluminum Company of America, New Kensington, Pa.

The Corrosion Division was organized because of the interest displayed by a large number of the members of the Electrochemical Society in this phase of the work. Object of the division is to coordinate the interests of the Society relating to corrosion, with individuals and organizations which are particularly interested and active in this field, to solicit papers and plan symposia.

Members of the Society interested in corrosion are eligible for membership in the Corrosion Division. Those persons who are not members, but are particularly interested in corrosion work, are invited to join the Electrochemical Society and participate in the work of the Corrosion Division.

AMERICAN GAS ASSOCIATION ELECTS OFFICERS

OFFICERS for the coming year elected at the national convention of the American Gas Association in Chicago included: president, Arthur F. Bridge, vice-president and general manager of Southern Counties Gas Co., Los Angeles, Calif.; vice-president, Ernest R. Acker, president of Central Hudson Gas & Electric Co., Poughkeepsie, N. Y.; chairman of the Technical Section, Harold L. Gaidry, New Orleans

Public Service Co., New Orleans, La.; vice-chairman of the Technical Section, Charles F. Turner, East Ohio Gas Co., Cleveland, Ohio.

Special recognition was given to two outstanding engineers of the industry in annual awards. The highest honor of the American Gas Association, the Charles A. Monroe Award, was conferred on W. M. Hepburn, Surface Combustion Co., Toledo, for outstanding recent contributions to the utilization of gas in industry. The Beal Medal, awarded for the most important technical contribution made to any program of the association in the past year, went to R. E. Kruger of Rochester Gas & Electric Corp., for his paper on "Interesting Developments Concerning the Saving of Gas Oil by Mixing High B.t.u. Coke Oven and Blue Gas."

NATIONAL FERTILIZER ASSOCIATION HOLDS SOUTHERN CONVENTION

MANUFACTURERS of commercial fertilizers from all sections of the country, but particularly from the South, gathered in Washington during the week of November 16 for the 18th annual Southern Convention of the National Fertilizer Association. The officers are John A. Miller of Louisville, Ky., president; H. B. Baylor, Chicago, vice-president; and Charles J. Brand of Washington, D. C., executive secretary and treasurer.

Dr. F. W. Parker, U. S. Department of Agriculture, spoke on "Fertilizers in the War Program;" Dr. T. S. Buie, Soil Conservation Service, Spartanburg, S. C., discussed "Saving Southern Soils;" and J. K. Westberg, Office of Price Administration, addressed the convention on "Price Ceiling and Fertilizer Problems." Dr. S. V. Sanford, chancellor of the University System of Georgia, gave an address on "Education, Agriculture and War."

Dr. W. H. Martin, director of the New Jersey Experiment Station, gave an address on "Equitable Distribution of Fertilizer in View of Nitrogen Shortage," which was followed by a panel discussion of the "Industry Plan for Distribution of Fertilizer in 1943," led by R. B. Douglass of Norfolk, Va.

SELECTIONS FROM CONVENTION PAPERS

THE THERMOFOR CATALYTIC CRACKING PROCESS

THE THERMOFOR catalytic cracking process is one of the major new developments in the art of catalytic cracking. The development has been carried through the semi-commercial stage in a 500-bbl.-per-day plant to the present design of commercial units ranging in oil-charging capacity from 2,500-10,000 bbl. per day. The process operates on the principle of continuous catalyst flow through the reaction zone, with the catalyst circulating continuously through separate systems which form a complete cycle of cracking and revivification. The separate reactor

and regenerator units are designed for efficient utilization of cheap catalysts and for flexibility of operation.

Development—The T.C.C. process derives its name from the Thermoform type of clay-burning kiln employed as the catalyst regenerating unit. The first commercial installation of the Thermoform kiln for percolation clay burning was placed in operation early in 1939, and since that time five additional units have been installed and operated.

Type of Catalyst—In adapting the Thermoform kiln to cracking-plant service, it was necessary to provide a catalyst having flow characteristics

similar to the granular percolation clays. Catalysts of this type have been developed successfully in the form of granular masses consisting predominantly of particles from 4-60 mesh. In this form, the catalyst mass flows freely through properly designed equipment. Catalysts may be formed to the proper particle size by pelleting or extruding powdered materials or by crushing large lumps.

At the present, commercial catalysts used in the T.C.C. process are prepared from especially treated natural clays which are cheap, costing only a few cents per pound. Attrition rates for these catalysts in commercial units will be less than 1.0 lb. of catalyst per bbl. of total oil charge to the reactor. Other catalysts of the synthetic or semi-synthetic type show considerable promise for future use.

Starting with the catalyst hopper located directly above the reactor, the clay flows downward by gravity through an elongated clay feed pipe, which supplies catalyst to a distributing hopper immediately above the reaction zone. Catalyst flows from this distributing hopper through several distributing pipes to the top of the main catalyst bed in the reactor. From this point the catalyst gravitates downward through the reactor counter-current to the oil vapors, which enter at the bottom of the reaction zone. This zone contains iron baffles designed to provide intimate contact between vapors and catalyst.

At the top of the reaction bed, vapors are released from the catalyst mass. In this mass are contained several flues which collect vapors from the reaction zone proper and conduct them through the top part of the catalyst bed into the open space immediately above. Below the oil inlet there is a purge zone, likewise containing baffles, in which the spent catalyst leaving the reaction zone is purged of oil vapors by means of superheated steam. The spent but purged catalyst is released through a valve and flows into a conveyor, where

Reactor

| | |
|--|---------|
| Temperature in reaction zone, deg. F. | 750-950 |
| Reactor pressure, lb. per sq. ft. | 10-15 |
| Ratio of catalyst to oil. | 1.0-8.0 |
| Steam, percent by weight of oil charge | 0-20 |

Regenerator

| | |
|---|--------------|
| Regenerator temperature, deg. F. | 700-1,100 |
| Operating pressure | Atmospheric |
| Air consumption, cu. ft. per ton of catalyst circulated | 2,000-20,000 |

it is carried to the supply hopper of the Thermoform-type kiln used for regenerating.

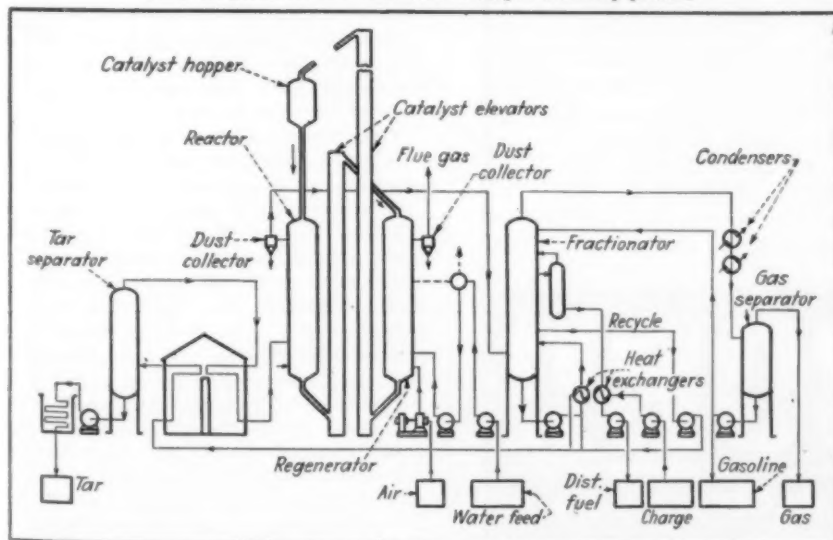
From the kiln supply hopper, the spent catalyst flows through distributor pipes to the top of the catalyst bed in the kiln burning zone. It then passes downward by gravity through the burning zone of the kiln counter-current to air supplied for burning. In this zone the carbonaceous deposit is removed from the catalyst by combustion with air.

A number of special types of T.C.C. kilns have been developed for catalyst regeneration, but for practical purposes the spiral-finned type may be considered as representative. With this, the main burning zone of the kiln is filled with a bundle of spiral-finned tubes designed to provide air passages up under the spiral fins, while catalyst moves slowly downward over and around the fins. Molten salt, steam, or other heat-transfer mediums may be circulated through the finned tubes to control burning and to prevent the catalyst from attaining heat-damaging temperatures. The fins provide both air passages and heat-transfer surface.

Combustion gases are released from the catalyst mass by means of flues which pass through the clay bed immediately above the heat-transfer system. Regenerated catalyst leaving the bottom of the kiln passes through a valve, and is picked up by a second conveyor which discharges it into the catalyst hopper above the reactor, thus completing the circuit. Regeneration of the catalyst is controlled without the recycling of flue gas or catalyst.

It will be noted that the T.C.C.

Flow diagram for the Thermoform Catalytic cracking process



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● This saboteur is Dust—silently sifting over the entire footage of your plant, day and night—week after week—slowing up your war production. But this saboteur *can* be trapped! Yes, Dust—the destroyer of machines and products, the menace to industrial efficiency, is no match for economical PANGBORN all metal frame, cloth screen dust collectors. For more than thirty-five years these silent sentinels of industry have guarded the interior of all types of plants, saving hard earned profits for their owners.

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process requires only moderate temperatures and pressures, which may be attributed largely to the efficient method of reacting and revivifying the catalyst. Plant construction is inexpensive, involving chiefly carbon steel and conventional refinery equipment. The process requires no compressors, the combustion air to the kiln being supplied by a low-pressure blower. The kiln itself has a variable regeneration capacity, permitting a wide choice of cracking conditions and charging stocks; and also is designed to convert the excess heat obtained from catalyst regeneration into high-pressure steam.

Finally, plants can be designed in smaller sizes without serious sacrifice in economy, thus making the process attractive to small as well as large-scale operators. At present, T.C.C. units have been designed in sizes of 2,500 bbl., 5,000 bbl., and 10,000 bbl. of charge per day to the reactor, but intermediate sizes may be designed to meet any requirement.

Motor-Gasoline—This gasoline is produced by the cracking of distillate stocks, either once-through or with recycling. Within the range of variables outlined previously, once-through operations give motor-gasoline yields of 35-62 volume percent on gas-oil charging stocks. Similarly, operations employing recycling of catalytic gas oils give motor-gasoline yields of 50-85 percent. Motor-gasoline yields of 35-45 percent single-pass, and of 50-60 percent with recycling, are representative of commercial proposals. Recycling operations are preferable, from the standpoint of ultimate yield, as the first step in the production of aviation gasolines.

Aviation-Gasoline—Aviation gasoline of excellent quality is produced by the reprocessing of the first-pass motor gasoline in a T.C.C. reactor operated on a once-through basis, at somewhat lower throughput rates than in cracking. This second-pass operation, which yields 80-95 percent of the aviation cut present in the motor-gasoline charge, serves primarily to improve the leaded octane numbers, oxidation stability, gum stability, and aromatic content of the aviation fraction. The octane number of such aviation gasoline, without tetraethyl lead, is 77-80, but with the addition of 3 ml. of tetraethyl lead per gal. the octane number is raised to 92-95.

From the standpoint of the national emergency, features of the T.C.C. process may be summed up as follows: (1) Good yields of 100-octane aviation blending stocks and butane-butylene cut for alkylation plant charge; (2) substantial yields of by-products, including heating oils, aromatics, and propylene; (3) low construction cost and adaptability to existing refinery equipment, bringing catalytic cracking within reach of small refiners; (4) low requirements for alloy steels and other strategic materials; (5) flexibility with respect to type of operation and character of charging stock; (6) conversion of excess heat obtained from

catalyst regeneration into high-pressure steam; (7) adaptability to wartime and peacetime production basis.

T. P. Simpson, L. P. Evans, C. V. Hornberg, and J. W. Payne, Socony-Vacuum Oil Co., Inc., Paulsboro, N. J., before the 23rd annual meeting of the American Petroleum Institute, Chicago, Ill., Nov. 11, 1942.

PHOSPHORUS ELECTRIC FURNACE REACTIONS

ELECTRIC FURNACE process for production of elemental phosphorus consists of smelting phosphatic material with sufficient carbon to reduce the phosphorus and iron present. Sizes of electric furnaces employed have increased in capacity and a number of furnaces are now operating with capacities of from 5,000-15,000 kw.

Furnace—The electric furnace must be carefully designed, constructed and operated to obtain maximum efficiency and economy. It must be as nearly gas-tight as possible to prevent leakage of phosphorus vapor. The shape of the furnace may be round, hexagonal or rectangular. The outer shell is made of steel plate; due allowances must be made for expansion and contraction. The shell is lined on the bottom and side with insulating material and brick to increase thermal efficiency and provide a smooth foundation for the lining of carbon blocks.

Carbon blocks of the furnace lining are arranged to form a crucible in which the smelting reaction takes place and the molten material accumulates. The crucible may be constructed of graphitic or amorphous carbon. Carbon blocks may be put together with machine fits with no bonding material, or spaces may be left between the blocks and these filled with carbon paste. In the latter case, after baking the crucible lining becomes monolithic. The taphole construction may consist of a carbon block with a hole which is shaped to form a frustum of an oblique cone. The large end, about 9 in. in diameter, is placed on the outside of the furnace shell and the smaller end, varying from 2-5 in., extends to the inside of the crucible. Some type of water cooling is usually employed in connection with the taphole.

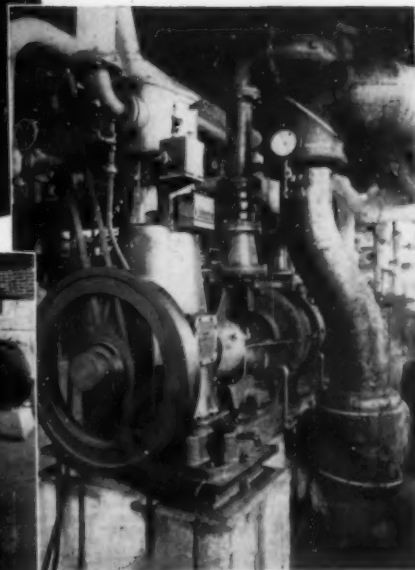
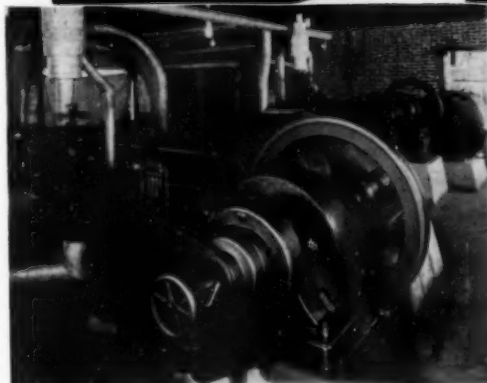
From the carbon sidewall of the crucible to the top of the steel shell, the lining is of firebrick construction. The roof is generally of arch-type construction with openings provided for charging the furnace, suspending the electrodes, and for gas outlet.

Furnaces are usually designed for use of three-phase electric current. Electrodes may be in line or located at the vertices of an equilateral triangle, depending on shape of the furnace. Electrodes are of graphite or carbon, and are generally cylindrical in shape and of jointed construction. They are suspended by cables over pulleys located on a superstructure above the furnace, and can be raised or lowered. Close-fitting openings in the furnace roof through which the electrodes pass are generally water cooled.

Phosphate Charge—In the process of

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WHAT is "by-product power?" Well, let's consider conditions which exist in countless process plants. Steam is required for processing or heating with two sources usually available: live steam from the boiler or exhaust steam from some prime-mover. If live steam from the boiler is used, its power is lost. If exhaust is used, the inherent power in the steam is captured en route. It's really "by-product power."

Under many conditions, the Troy-Engberg Steam Engine fits into this "by-product power" situation better than any other drive. It's "by-product power" at its best, furnishing the necessary steam for processing or heating while at the same time producing power at the lowest cost . . . often at a cost sufficient to pay for the engine in a few months, or a year or two. And always, the Troy-Engberg Steam Engine is dependable, flexible, durable and quick-starting. It has high-starting torque and ability to handle heavy overloads for long periods.

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DESPATCH CHEMICAL DRYERS WIN VICTORIES OVER TIME

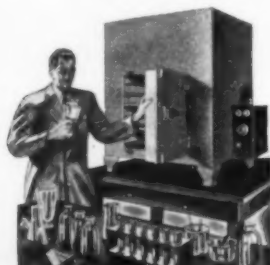
How to save 75% in
PROCESSING TIME

Faster processing of capacity loads—in
70% to 80% less time—is regularly re-
ported by users of Despatch Ovens.

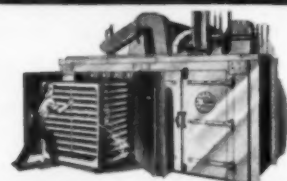
This is chiefly the result of new fea-
tures which allow faster heat transfer
without sacrificing uniformity.

FAST RECOVERY—EASY LOADING

2 to 8 minutes recovery after loading a
cold charge is standard performance for
Despatch laboratory ovens . . . Fan-
driven forced convection heat penetrates
load quickly. Adjustable exhaust damper.
Easy-loading shelves, racks.



IN THE LABORATORY



IN PRODUCTION

● ACCURATE temp. control ($\pm 1^\circ\text{C}$. sen-
sitivity) permits controlled processing
within temperature range to 500°F .
(260°C .) Long-life elements.

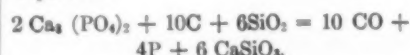
● COMPACT and rugged for all service
conditions. Good insulation. Elec. or gas
heating systems. Efficient recirculation
and distribution.

● FLEXIBLE to permit use for test-
baking, solvent-drying, aging, sterilizing,
at any temp. Easy-loading shelves on
laboratory models. Racks, etc., available
for larger production models.

WRITE TODAY for Bulletin 105-A. Please
indicate your requirements, specifying
laboratory or production ovens.

DESPATCH OVEN
COMPANY
MINNEAPOLIS MINNESOTA

smelting phosphate rock, the furnace is
charged with phosphate rock, silica and
carbon. Sufficient heat is supplied by
the electric current to fuse the phos-
phate and permit its reduction by the
carbon in the charge. The chemical re-
action which takes place is generally
expressed:



Experience has shown that the charge
composition should be adjusted to yield
a slag having a silica-lime weight ratio
of 0.75-0.90. Such slags have low melt-
ing points, yet are sufficiently acid to
flux off the basic constituents liberated
by reduction of the phosphate.

To render Tennessee rock suitable for
use in the furnace, some means of ag-
glomeration such as sintering or nodu-
lizing is employed. In the process of
nodulizing, phosphatic material of con-
trolled composition is fed into a rotary
kiln. As the material passes through the
kiln, counter-current to hot combustion
gases, it is gradually heated. Near the
discharge end the material approaches
a state of fusion and spherules of var-
ious sizes are formed. The air used
in the combustion of gases for heating
the kiln is preheated by contact with
hot phosphate nodules discharged from
the kiln.

Agglomeration of phosphate material
may also be accomplished by sintering.
This operation may be carried out in
standard machines of the type normally
employed for sintering flue dust.

Carbon Charge—The furnace charge,
in addition to nodulized or sintered
phosphate rock and silica gravel, must
contain some elemental carbon for re-
duction. This is usually furnished in
the form of coke breeze having a fixed
carbon content of about 85 percent.
Amount of carbon added to the charge
should be very accurately controlled. It
must be sufficient for reduction of
phosphorus, iron and other reducible
elements in an oxidized condition in
the charge, yet not greater than that
which would be consumed in the
furnace operation. As the amount of
carbon in the charge is increased, the
greater will be elimination of phos-
phorus from the slag. Excess carbon
will decrease the quality of the hy-
product ferrophosphorus by lowering
its phosphorus and increasing its sil-
icon content. Satisfactory operation
may be obtained by maintaining the
 P_2O_5 content of the slag between 0.5-2.5
percent. With a P_2O_5 content of ap-
proximately 2.0 percent in the slag,
the ferrophosphorus produced will be
low in silicon and will contain from
24-25 percent P.

Furnace Operations—Heat supplied
by the electric current raises the tem-
perature of the charge and the smelt-
ing reaction proceeds. CO and phos-
phorus vapor, liberated in the reaction
zone, pass upward through a layer of
descending charge and, preheating the
charge, are partially cooled and filtered.
Certain constituents of the charge are
partially volatilized and contaminate
the gaseous products to some extent,
although primarily these constituents

are removed in the form of slag. Appreciable amounts of fluorine, potassium, sodium and silica are volatilized and partially condensed, forming fumes which are carried out with the gases. The quantity of these contaminants and of the dust carried with the gas is dependent on the depth, sizing and physical character of the furnace charge above the fusion zone.

Dust and fume can be removed to a large extent from the gases by dust collectors or by electric precipitators before the gas temperature is reduced to the point where condensation of phosphorus takes place. These materials may also be collected in the phosphorus-condensing equipment and subsequently separated from condensed phosphorus. The phosphorus vapor content of the gases drawn from the furnace will average from 150-190 grains P/cu.ft. of gas, calculated on normal temperature and pressure.

Temperature of the gases is maintained above the dew point of phosphorus until these gases reach the condenser, where they are cooled down to just above the melting point of phosphorus. At this temperature the vapor pressure of phosphorus is quite low and practically complete condensation takes place. Under these conditions the condensed phosphorus is in the form of a liquid which may be pumped to storage tanks and stored under warm water.

Elemental phosphorus has a melting point of 44.1 deg. C.; accordingly all transfer pipes, pumps and other handling equipment must be heated so as to keep the material liquid. For bulk shipment, the liquid phosphorus is pumped into steel tank cars under a layer of water and the phosphorus allowed to solidify. These cars are equipped with pipe coils which may be connected to a source of cold water at the loading point for solidifying, or steam at the unloading point for remelting.

Gas leaving the condenser equipment, after complete removal of phosphorus, is about 96 percent CO. It usually contains small amounts of non-condensable impurities such as CO₂, H₂, N₂, and hydrocarbons. The gas is valuable as a fuel.

Iron compounds present in the furnace charge are reduced. Iron immediately combines with a portion of the phosphorus to form ferrophosphorus. Most of the Mn present in the charge is also reduced and alloys with the iron to form a component part of the ferrophosphorus.

Molten slag and ferrophosphorus alloy are simultaneously tapped out of the crucible into skimming pots where the metal alloy sinks to the bottom and the slag overflows into a slag ladle or pit. After cooling, the metal alloy is recovered and sold as such or further processed for recovery of its phosphorus in the form of alkali metal phosphates.

C. P. Zergiebel and James W. Lucas, Victor Chemical Works, Mount Pleasant, Tenn., before the Electrochemical Society, Nashville, Tenn., April 15-18, 1942.

"Co-ordinated action" will win the war!

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

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THAT GIVES SUCH

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**Dustless!
No Separation!**



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Delivers weighed, assembled substances into large drum, while slowly rotating. Material is picked up by revolving buckets, carried to top of blending chamber, thrown into stream of incoming feed. This, plus revolving action, is ideal blending. Materials are forced from both sides to middle of drum, adding a third blending action with no separating effect. Light substances do not float and remain unblended. Scientifically blends materials, 1st, to definite chemical analysis; 2nd, various sizes together; 3rd, colors to a precise exactness. Leak-proof because dustless construction. No internal moving parts to break down original composition of material! Intake and discharge through same opening.



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THROUGH
SAME OPENING**

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AIR SEPARATORS**

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2. A Laboratory You Can Call Your Own... where our technical information, plus the laboratory facilities, can help you fit the right metal to your need.
3. Publications From Our Techni-

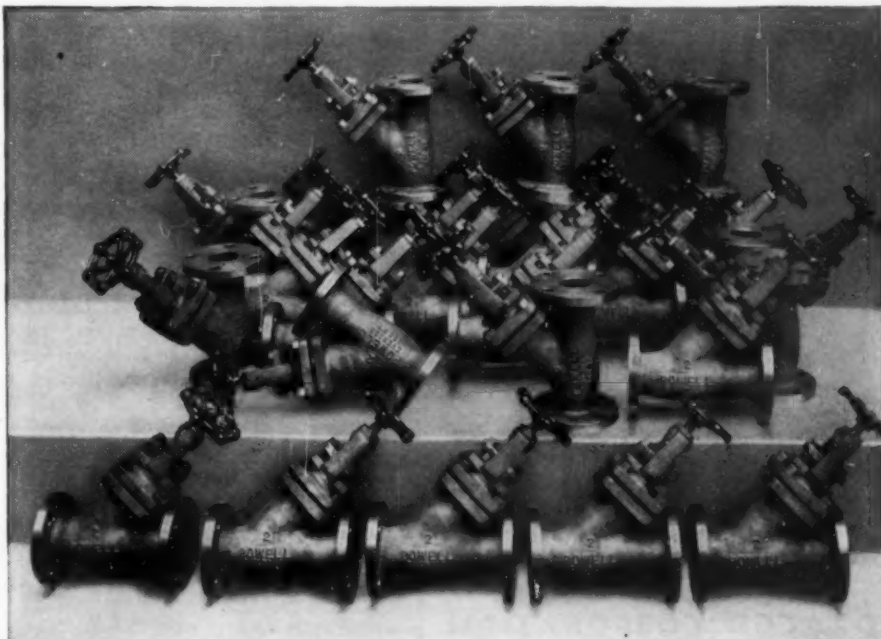
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ful technical information which your engineers will find extremely helpful at this critical time.

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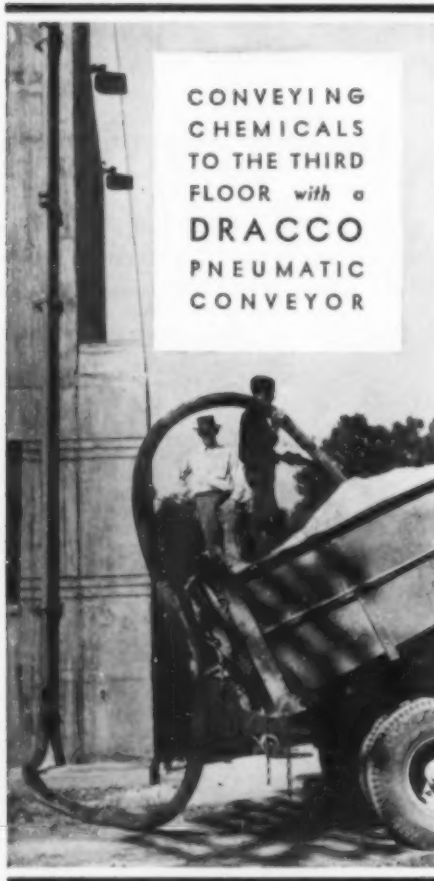
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SELECTIONS FROM FOREIGN LITERATURE

THERMAL EXPANSION OF REFRACTORIES

EXPANSION characteristics are reported for some synthetic binary lime-magnesia silicates and for several ternary compounds (akermanite, diopside monicellite, merwinite, cordierite, gehlerite, and anorthite). The results help to explain the expansion characteristics of steatite and asbestos products. Fired fireclay shapes pass through a maximum in thermal expansion coefficient at about 800 deg. C. This is now explained by a peculiarity of anorthite, which occurs in such products. Between 750 and 900 deg. C. anorthite has an exceptionally large increase in expansion. There is also a pronounced increase in expansion of refractory brick from a dolomite hearth. This occurs between 925 and 1,200 deg. C. and has not yet been explained. It has also been observed in the thermal decomposition products of a lime-bearing steatite. Tabulated data show the expansion behavior of steatites, asbestos, magnesia, quicklime, dolomite brick (new and used), fired olivine and several synthetic binary or ternary silicates.

Digest from "Thermal Expansion Characteristics of Some Calcareous and Magnesian Minerals," by G. R. Rigby and A. T. Green, *Transactions of the British Ceramic Society* 41, 123-43, 1942. (Published in England.)

CONTROLLING DIAZOTIZATION

IN DIAZOTIZING sulphanilamide on a factory scale it is difficult to detect the nitrite endpoint by the usual reagents, which are oxidizing agents. It has now been found that the leuco base of methylene blue is a sensitive and reliable indicator. Its use permits accurate chemical control of diazotization. This leuco base is so sensitive that it can be used well below the practical limits of sodium nitrite concentration in diazotization baths. Positive tests are obtained down to a concentration of about N/1,000,000. Even at such extreme dilution the color test remains for at least 2 hr., and longer in more concentrated solutions. The utility of this test is not limited to diazotization control; it can be applied wherever nitrites are used or occur and should be particularly useful in analysis of potable waters.

Digest from "Leuco Base of Methylene Blue in Diazotization Control," by Emilio A. Soules, *Anales de la asociacion quimica argentina* 30, 96-8, 1942. (Published in Argentina.)

VEGETABLE DIESEL OILS

DIESEL-POWERED trucks can be successfully operated on vegetable oils with a consequent saving in petroleum oils if certain precautions are observed. A small proportion of ordinary diesel fuel is needed because the low-temperature viscosity of vegetable oils is too high for satisfactory starting. Hence the engine should be started on mineral

oil and operated until the vegetable oil is warm. By installing a simple heater tank the warm-up can be accomplished in 10 to 20 min. If the engine is to be stopped long enough for the oil to cool it should be run on mineral oil the last few minutes. Road tests with heated vegetable oil brought new emphasis to the advantage of warming diesel oil, since engine efficiency is improved even on mineral oil by preheating the oil. The three best vegetable oils for use as diesel fuel are peanut, cottonseed and palm oils, in descending order of merit. The tests were made with no special tuning of the engine other than adjusting the nozzles as recommended by the manufacturer for operating on gas oil. An experimental study of engine adjustments might be fruitful.

Digest from "Vegetable Oils in Commercial Vehicles," by R. H. Seddon, *Gas and Oil Power* 37, 136-41, 146, 1942. (Published in England.)

STRENGTH OF PHENOPLASTS

STRENGTH of plastics depends on chemical constitution and physical structure. Of these the latter is more amenable to control. Reinforcing fillers should have high tensile strength, strong adhesion to the plastic and elasticity at least equal to that of the plastic. For tensile stresses in one dimension, long-fibered fillers oriented in the stress direction give the best reinforcing effect. For three-dimensional stresses or for shearing stresses parallel to the fiber direction such fillers are ineffective. Short fibers with random orientation are needed for such stresses. In strength tests, three fracture types are distinguished: (1) amorphous, perpendicular to stress axis; (2) fracture free oblique to the stress axis; (3) random zigzag and furrowed fractures. The approximate percentage distribution of these fracture types in various plastics was found to be as shown in the table.

| Resin type | Plastic Filler | Fracture type | | |
|------------|-----------------------|---------------|----|----|
| | | 1 | 2 | 3 |
| Phenoplast | Wood flour | 100 | 0 | 0 |
| Phenoplast | Asbestos powder | 45 | 55 | 0 |
| Phenoplast | Asbestos fiber | 40 | 60 | 0 |
| Phenoplast | Textile fiber | 15 | 55 | 30 |
| Urea | Wood flour | 90 | 10 | 0 |
| Urea | Asbestos | 95 | 5 | 0 |
| Melamine | Wood flour | 70 | 30 | 0 |
| Melamine | Asbestos powder | 100 | 0 | 0 |
| Melamine | None | 50 | 50 | 0 |
| Melamine | None (resin hardened) | 90 | 10 | 0 |

Digest from "Relation Between Texture and Strength of Molded Phenoplasts," by W. Siegfried, *Schweizer Archiv für angewandte Wissenschaft und Technik* 8, 255-62, 1942. (Published in Switzerland.)

CYCLIZATION OF HYDROCARBONS

IN THE catalytic dehydrogenation-cyclization of mixed petroleum hydrocarbons to form aromatics, some naphthalene is generally formed (most commonly about 1 percent of the product). Activated alumina, which is itself a cyclization catalyst, is also an effective

promoter on copper chromite and molybdenum sulphide catalysts. Normal heptane is easier to aromatize than commercial heptene, and gives up to 55 percent yield of toluene. For example, 53 percent overall conversion to toluene was effected by heating n-heptane at 550 deg. C. over a standard molybdenum catalyst. The same reaction gave 1 percent of naphthalene, 5 percent of unsaturates and 40 percent recovery of unchanged n-heptane. The same catalysts which aromatize hydrocarbons are also active as desulphurization catalysts, and under technical conditions aromatization of distillates containing sulphur is inseparable from desulphurization. Molybdenum sulphide, if freshly prepared in the catalyst tube, has a higher desulphurization activity than chromium sulphide catalysts. There is some loss in yield through gasification and carbonization, and the aromatization reaction is also complicated by dehydrogenation and hydrogenation reactions in which some unsaturates are formed. Several reactions can thus be effected at the same time, and to some extent the results can be controlled by selecting suitable catalysts.

Digest from "Cyclization of Hydrocarbon Mixtures," by S. J. Green, *Journal of the Institute of Petroleum* 28, 179-208, 1942. (Published in England.)

IMPROVING COKE QUALITY

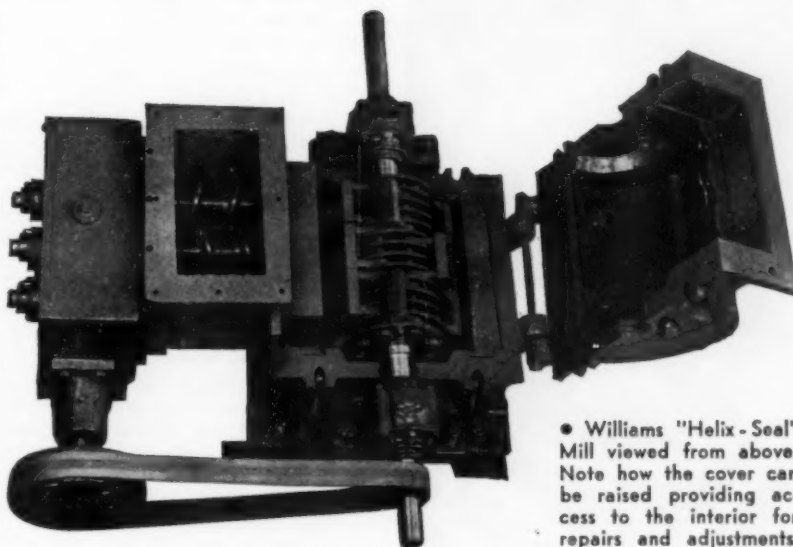
Coke quality can be improved by blending bright coal with 50 percent or less of durain from the same seam. Durain from other seams has also given good results. The quality of coke made from bright coal alone is proportional to the heat value of the coal, but the improvement imparted by durain is not proportional to the heat value of the durain. Tests on improvement of cokes from blended slacks show that considerable proportions of non-coking slack can be incorporated in a coking slack while still maintaining satisfactorily nonabradable quality in the coke. An analytical method has been developed which permits carbon, hydrogen, sulphur and chlorine to be determined in coal or coke, all in one sample and all in 60 minutes. A laboratory test for abrasability of coke has also been reduced to standard conditions. Anthracite coke and vertical retort gas coke have been successfully activated, for use in mobile gas producers, by spraying with sufficient sodium carbonate to leave about 1.5 percent in the coke.

Digest from "Improving the Quality of Coke" and "Combustion and Gasification," by the Midland Coke Research Committee, Report of Progress During 1941, *Fuel in Science and Practice* 21, 94-5, 1942. (Published in England.)

SILICA REFRACTORIES

THE STABILITY of silica retort settings in actual operation depends on the extent to which firing of the bricks, segments or special shapes has converted quartz to other crystalline forms of silica (cristobalite and tridymite).

DUSTLESS FINE GRINDING 100 TO 325 MESH . . . WITHOUT FANS OR COLLECTORS



• Williams "Helix-Seal" Mill viewed from above. Note how the cover can be raised providing access to the interior for repairs and adjustments.

WILLIAMS "HELIX-SEAL" PULVERIZER INEXPENSIVE TO INSTALL . . . CHEAP TO OPERATE

The Helix-Seal Mill grinds extremely fine without the aid of outside separation. This is largely due to the long grinding surface, adjustable grinding parts and high speed of the hammers. Due to the screw feeder which acts both as a feeder and seal, sealing the intake opening against the in-rush of air, no air is sucked into the machine and consequently there is no resulting dust carrying draft expelled from the discharge. Built in nine standard sizes, capacities 200 pounds per hour and up.

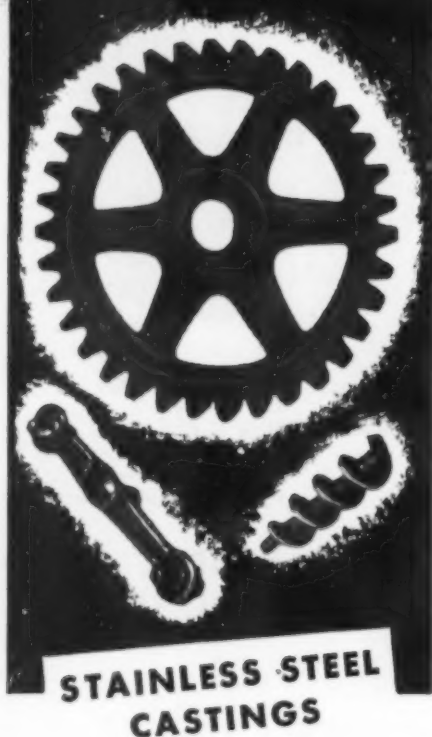
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These crystalline changes are accompanied by volume expansion. Proper choice and use of the bonding agent must also be duly considered. Whether lime-bonded or clay-bonded retorts are to be made, the bonding cement should contain some quartz. Well made settings seldom have joints thicker than $\frac{1}{8}$ in. and much more water is needed in the cement than in making molded shapes for kiln firing. The joints must not be compacted into position. They then have ample porosity to accommodate the expansion of quartz when the retort is heated in service. An improved procedure has been developed for microscopic examination of powder samples to ascertain the degree of conversion to cristobalite and tridymite. The method includes refractometric estimates which can be made accurate within 2 percent and are seldom in error more than 3 percent. Reliability of surface scratchings as powder samples has been questioned, but experiments confirm the belief that conversion under firing conditions penetrates throughout the quartz and that powder from the surface is truly representative.

Digest from "Microscopic Examination of Silica Refractories," by P. F. F. Clephane, *Gas Journal* 239, 282, 287-8, 1942. (Published in England.)

DECORATIVE CHROMIUM PLATING

AN IMPROVED method has been developed for applying ornamental chrome plate to sandblasted iron shapes which have been copper plated from a cyanide bath. As compared with ordinary chrome plating practice on brass the optimum temperature in the new process is 50-52 instead of 43-45 deg. C., and the current density is correspondingly raised to 25 instead of 10-15 amp. per sq.dm. The starting current is double (50 amp. per sq.dm.) and it is held 2 min. instead of 80 sec. More care is taken to maintain optimum conditions, and the pieces being plated are spaced farther apart in the electrolytic bath. Pieces remain in the chrome bath 20 min. They are then washed in running water and held in hot soda solution 30 min. (100 g. per l. Na_2CO_3 at 80 deg. C.). Neutralization of the last traces of chromic acid is strictly necessary, more so than for chrome plate on brass. The thoroughly neutralized plated pieces are washed with hot running water, then with hot distilled water. They are finally dried in a drying cupboard, 25-30 min. at 200 deg. C. Conditions have also been formulated for gloss etching of the copper coat before chrome plating.

Digest from "Decorative Chrome Plating of Copper-Coated Sandblasted Iron Shapes" by Ya. L. Vertsman, *Zhurnal Prikladnoi Khimii* 14, 507-10, 1941. (Published in Russia.)

OXIDIZING AMMONIA

In a study of kinetic relations in oxidizing ammonia with oxygen-enriched air, it was found that rising ammonia concentration decreases the contact

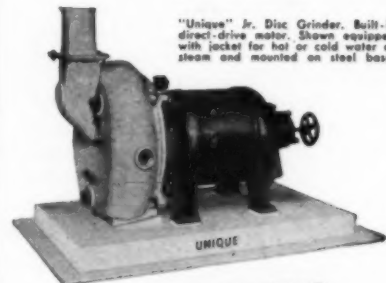


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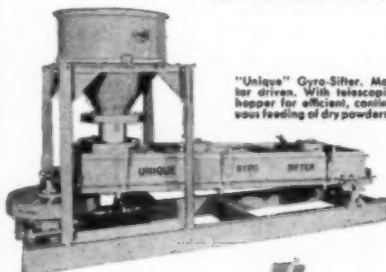
"Unique" Saw Tooth Crusher. Special grade steel saws, mounted in roller bearings. Heavy-duty balance wheel carries intermittent shock load.



"Unique" Jr. Disc Grinder. Built-in direct-drive motor. Shown equipped with locker for hot or cold water or steam and mounted on steel base.



"Unique" Tumbling Prism Mixer. Driven by gearhead motor. For handling dry powders that cannot stand much agitation. All-steel welded frame.



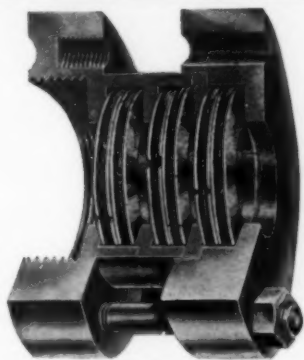
"Unique" Gyro-Sifter. Motor driven. With telescopic hopper for efficient, continuous feeding of dry powders.



"Unique" Mixer. All-steel welded... extra large. Equipped with cold water jacket, mixing inlet and two inspection doors. Solid stainless steel construction.

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ratio but that the productivity of the platinum-rhodium gauze catalyst increases in nearly direct proportion to the ammonia concentration. For good yields the $O:NH_3$ ratio in the gas mixture must be above 1.7 and the optimum ratio for large scale operation is about 2.2 or slightly more than the theoretical mol ratio 2:1. In operating converters on a factory scale with 95-96 percent contact a gas containing 13.5-14 percent NH_3 and 27-28 percent O_2 will oxidize about 1.05 metric ton of NH_3 per day per sq.m. of catalyst surface. Temperature fluctuations between 850 and 900 deg. C. do not impair the yield. Output capacity of nitric acid plants can be increased by use of oxygen-enriched air under optimum conditions.

Digest from "Kinetics of Ammonia Oxidation With Oxygen-Enriched Air," by V. I. Atroshchenko and E. G. Sedasheva, *Zhurnal Prikladnoi Khimii* 14, 500-6, 1941. (Published in Russia.)

NEW GERMAN MATERIALS

CHILLED castings of 65-70 percent ferrosilicon have been used in the I. G. Farbenindustrie Works at Höchst as a corrosion-resisting material, especially in large boilers with up to 6 cu.m. volume. They withstand all acids with the exception of hydrofluoric, but do not protect against strong alkalis. Pressure resistance is 4,000 kg. per sq.cm., tensile strength between 60 and 100 kg. per sq.cm., heat conductivity 40 kcal. per m. hr. deg. C. Expansion at rising temperatures is half that of steel, and modulus of elasticity five times greater than that of steel. Ferrosilicon plates welded to steel are soldered without tin, and joints are protected with a special acid-resisting putty. This treatment is said to be equal in value to enamel in many respects, and superior to it in that it can be applied to large vessels, imparts greater mechanical strength, and can be easily repaired. No serious complaints, it is claimed, were reported in operation over two years.

Less than 6 oz. of chromium per sq.m. are said to be required to confer corrosion resistance on pipes and other metal surfaces by the so-called BDC-Inkrom process, said to be used on a large scale in Germany for the protection of steels which contain no protective alloy metals, but are especially selected for the process. Volatile chromium compounds are made to react with the surface of the article which is to be protected at a temperature of about 1,000 deg. C. either directly or in a salt melt, or by means of ceramic products in which they are stored. The chrome content of the protective steel amounts to 35 percent on the surface and declines at a regular rate inward. Corrosion resistance is, down to a depth of 1/25 in., equal to a high percentage chromium steel, it is reported.

From "New German Materials, Corrosion Resistant Apparatus," *The Chemical Age* XLVII, No. 1206, August 8, 1942. Page 122. (Published in England.)



Official Navy Photo

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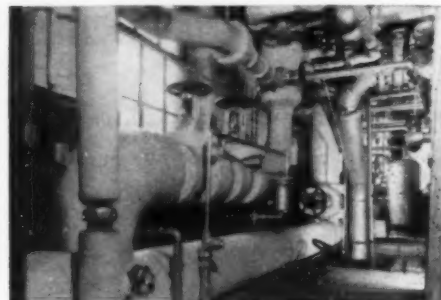
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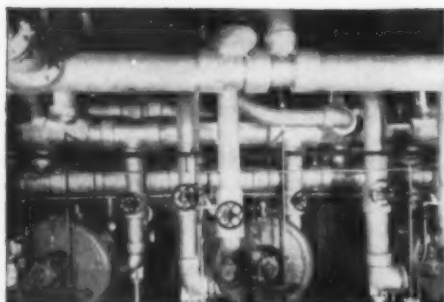
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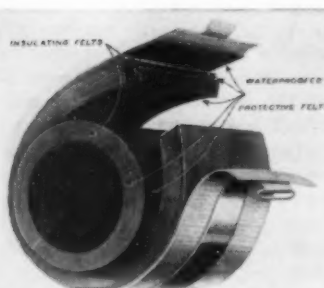
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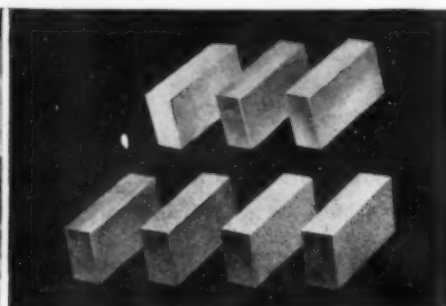
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New Titles, Editions and Authors

PETROLEUM CHEMISTRY

CHEMICAL TECHNOLOGY OF PETROLEUM. Second edition. By *William A. Gruse* and *Donald R. Stevens*. Published by McGraw-Hill Book Co. New York, N. Y. 733 pages. Price \$7.50.

THIS volume is a complete revision of Gruse's work formerly published in 1928 as "Petroleum and Its Products." However, the present edition is almost an entirely new book, since every chapter has been rewritten and new chapters have been added on thermodynamics as applied to the problems of hydrocarbon chemistry, chemistry of production methods, etc.

The present work is the only general treatise of its kind dealing with the chemical interpretation of the facts known about petroleum and its utilization. And there is no doubt but that it is an outstanding contribution to the literature on petroleum, this country's great organic raw material. The authors, outstanding authorities in the field, have turned out a first-class job. In addition to being authoritative, the work is extremely comprehensive, as demonstrated by the many bibliographical footnotes. There is little doubt but that every petroleum technologist in the country will soon add the book to his working library.

Chapters of the present edition deal with composition, classification and description of crude petroleum, chemical composition of petroleum, group reactions of petroleum oils, physical properties, production chemistry, origin of petroleum, distillation, refining by chemical methods, refining by physical methods, cracking of petroleum oils, chemical thermodynamics of petroleum hydrocarbons, gasoline and other motor fuels, kerosene, lubrication and petroleum lubricants, paraffin, amorphous waxes and petrolatum, fuel oils, petroleum asphalts and miscellaneous petroleum products and by-products. An appendix of 45 pages gives, in table form, the physical constants of hydrocarbons.

NEW TECHNICAL AND COMMERCIAL DICTIONARY. By *Antonio P. Guerrero*. Published by Editorial Tecnica Unida, Brooklyn, N. Y. 600 pages. Price \$10.

Reviewed by *M. G. Callahan*

THE APPEARANCE of this dictionary should be particularly welcome at this time, since the need for a Spanish and English technical reference is greater than ever. It contains words used in electrical, mechanical, chemical and marine engineering, radio, mining, textile and other industries. There are modern words referring to mechanized and motorized warfare, aviation, meteorology, etc. The number of definitions of technical phrases is quite high considering the size of the dictionary and the many fields it is claimed to

cover. There are only about 25,000 words per section (Spanish-English and English-Spanish) whereas the average-size foreign technical dictionary usually contains 50,000 words and more.

No bibliography is cited except for two references, which is rather unusual in the compilation of a technical dictionary. As a result, the chemist and chemical engineer will find some rather startling translations. For example, the Spanish "nitrurar" is translated as "to nitrurate," a word which is non-existent in the English language. "Sulfido" is translated as "sulphite," and "sulfito" as "sulphide," a rather neat reversal. "Sulfato de barita" is translated only as "caw" which is an accurate but rather unusual term used in England for barytes or barium sulfate. Many similar examples of negligence can be found. Reference to any of the reliable and easily available English technical and chemical dictionaries would have resulted in more accurate and idiomatic definitions.

In the back of the book there are twenty pages of useful conversion tables of weights and measures, English and metric systems.

In the preface the author states that his purpose in producing this dictionary was to "give help at the needed moment to the engineer at his work, to the importer at his desk, to the technician in his laboratory, and to the soldier in the barracks." No doubt it will be useful to these people, but the purpose would have been served even better if the price were more reasonable.

HEAT TRANSMISSION. Second edition. By *W. H. McAdams*. Published by McGraw-Hill Book Co., New York, N. Y. 459 pages. Price \$4.50.

Reviewed by *P. W. Schutz*

THE SECOND edition of this already well established reference work is a thorough and critical revision of the earlier edition. The author has included data and techniques which appear in the literature as recently as the first half of 1942.

The list of over 800 references indicates the extent of material covered. All of the subject matter has been considered critically and the recommended procedures are the best available at the present time. The extensive use of graphical correlations (there are 206 figures, the majority of which are curves representing the data presented) makes the material very easy to use. A separate index to all of the recommended correlations for convective heat transfer greatly facilitates the use of the book.

A new chapter on the application of general methods to design is a valuable addition. The complete treatment given a number of special cases indi-



cates clearly the method of attack for any case. Another new feature is the inclusion of a large number of unsolved problems. From a textbook standpoint this has greatly increased the utility of the book.

The 38-page appendix contains a wealth of physical data, in nomograph and curve form where possible, and abbreviated pipe and tubing data. The unfortunate omission of identifying numbers on the liquid Prandtl number nomograph will undoubtedly be corrected in new printings.

This book is an excellent presentation of the latest information on the subject and should be readily available to anyone working in this or any allied field.

PLASTICS HANDBOOK

PLASTICS FOR INDUSTRIAL USE. By *John Sasso*. Published by McGraw-Hill Book Co., New York, N. Y. 229 pages. Price \$2.50.

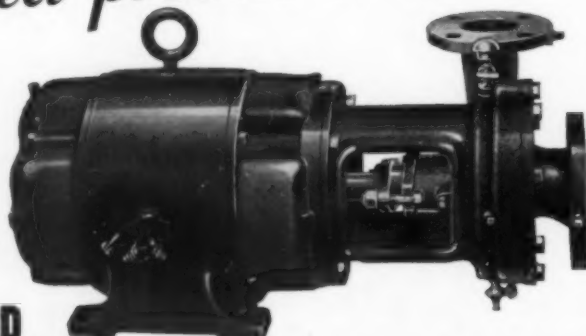
IN A field that is as new as plastics, new data and information are constantly being added to what is already known about the established materials, and new plastics are being developed and offered for industrial use. Therefore each new book dealing with plastics must necessarily contain new material. This engineering handbook of materials is full of tables covering the physical, mechanical, thermal and electrical characteristics. Also the chemical resistance of the various plastics are tabulated. Brief descriptions of the manufacturing processes are included. While much of this information is of interest to chemical engineers, the book has been prepared primarily for the design engineer.

NATIONAL PAINT DICTIONARY. Second Edition. By *Jeffrey R. Stewart*. Published by the Stewart Research Laboratory, Washington, D. C. 224 pages. Price \$7.50.

MANY ADDITIONAL terms and more than 100 new illustrations are included in the second edition of this dictionary that the first edition, issued in 1940, did not contain. In addition, many definitions have been expanded to include more recent and complete data. The book contains definitions of terms used, along with pertinent information regarding the names of chemicals and raw materials, trade names, methods

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of analysis, equipment, and apparatus employed in the paint and allied industries. In fact, the volume is not just a dictionary but is a comprehensive, all-inclusive glossary of materials, methods and techniques used by the protective and decorative coatings industry.

Included as supplementary material are extensive tables and charts on such subjects as flash points of oils and volatile liquids, color identification tests for pigments, composition and constants of drying oils, solvencies of natural resins, distillation range of important solvents, bulking values of pigments, pigment content of paste tinting colors and applications of natural resins.

This dictionary should prove to be a handy reference volume for formulators, chemists, production managers, salesmen, distributors and others concerned with the production, distribution and application of paint and allied products. Printing, paper stock and binding are all excellent.

MOLECULAR FILMS, THE CYCLO-
TRON, AND THE NEW BIOLOGY.
Essays by H. S. Taylor, E. O. Lawrence and Irving Langmuir. Published by Rutgers University Press, New Brunswick, N. J. 110 pages. Price \$1.25.

Reviewed by F. C. Nachod

AT THE 175th anniversary of the founding of Rutgers University, three well-known scientists delivered lectures which form the contents of this little volume.

The first essay is entitled "Fundamental Science from Phlogiston to Cyclotron" and is by Princeton's Dr. Hugh S. Taylor. In most compact form, 24 pages, Professor Taylor sketches a brief history of chemistry, physics, and biology, which is concluded by a philosophical analysis of science in our days.

The second paper is by Dr. Irving Langmuir and bears the title "Molecular Films in Chemistry and Biology." It gives an excellent cross-section of the author's own work on surface films. Emphasis is laid on the interrelationship of the various fields of science. A physical tool for the investigation of the interface between water and air was developed by a physicist who started out as a chemist, to enable the biologist to understand phenomena furnished by proteins and enzymes.

The third part, "Nuclear Physics and Biology," comes from University of California's Dr. Ernest O. Lawrence. The cyclotron which has been developed by Professor Lawrence, is described and shown in illustrations. Various applications in biology and medicine such as the synthesis of radio-active tracers, the cure of cancer, radio-active carbon and photosynthesis are discussed.

Commentaries on the personalities of Langmuir and Lawrence are added from Drs. Chambers and Dunning. These, though appropriate as oral

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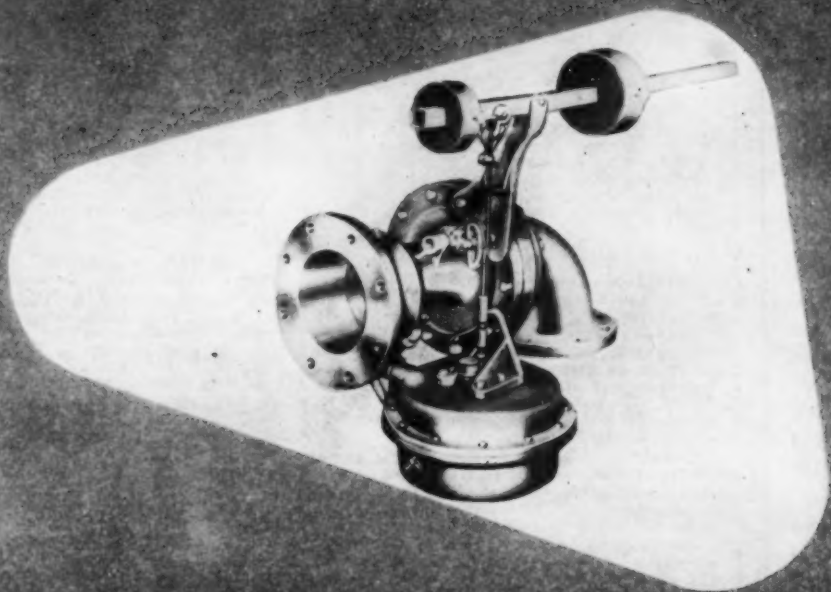
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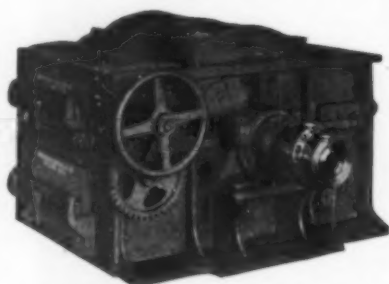
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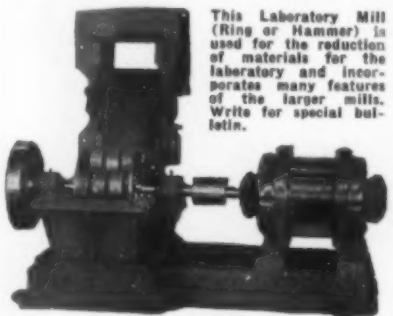
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tribute, are in the reviewer's opinion quite superfluous if they appear in print. They tend to deduct from the value of this little book. Men of the caliber of the authors of this work are too well known to need any such introduction.

These three essays should make us all realize that there is a "universitas literarum" and that the trend of present scientific work is a unification and not what we might term a "detached specialization." With this in mind, every modern scientist should read this work, and appreciate and understand Taylor's conclusion:

"The processes of mutual cooperation and assistance among individual units of science must be multiplied.

GOVERNMENT PUBLICATIONS

The following recently issued documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. In ordering publications noted in this list always give complete title and the issuing office. Remittances should be made by postal money order, express order, coupons, or check. Do not send postage stamps. All publications are in paper cover unless otherwise specified. When no price is indicated, pamphlet is free and should be ordered from Bureau responsible for its issue.

Controlled Materials Plan, November 2, 1942. War Production Board unnumbered pamphlet. Explains method for regulated distribution of copper, aluminum, and steel.

Wages and Salaries. Mimeographed summary of regulations issued by Office of the Director of Economic Stabilization. Defines conditions under which salary and wage adjustments may be made under the present law as applied by Economic Director James F. Byrnes.

Tax Law. Public Law 753, 77th Congress, 2nd Session. "To provide revenue and for other purposes." This is the Revenue Act of 1942. Price, 15 cents.

The Toxicity and Potential Dangers of Toluene, with Special Reference to its Maximal Permissible Concentration, by W. F. von Oettingen et al. U. S. Public Health Service, Bulletin No. 279. Price, 10 cents.

Effect of Homogenization on the Curd Tension, Digestibility, and Keeping Quality of Milk, by C. J. Babcock. U. S. Department of Agriculture, Technical Bulletin No. 832. Price, 5 cents.

Methods for Manufacturing Acid-Pre-precipitated Casein from Skim Milk, by Earle O. Whittier. U. S. Department of Agriculture Circular No. 279 (Revised). Price, 10 cents.

Further Studies on the Removal of Spray Residues from Eastern-Grown Apples, by M. H. Haller, C. C. Cassil, Edwin Gould, and A. L. Schrader. U. S. Department of Agriculture, Technical Bulletin No. 828. Price, 10 cents.

Velvetbeans, Cottonseed Meal, and Peanut Meal as Protein Feeds for Fattening Steers in the Coastal Plain Area, by Earl W. McComas, James R. Douglas, and Byron L. Southwell. U. S. Department of Agriculture, Technical Bulletin 831. Price, 5 cents.

Mineral-oil Treatment of Sweet Corn for Earworm Control, by George W. Barber. U. S. Department of Agriculture, Circular 657. Price, 5 cents.

Plastics (Basic Information Sources). Bureau of Foreign and Domestic Commerce, Inquiry Reference Service. Mimeographed.

List of Publications on Optical Instruments, Refractometry and Optical Properties of Glass. National Bureau of Standards, Letter Circular 704. Mimeographed.

Photoelectric Tristimulus Colorimetry with Three Filters, by Richard S. Hunter. National Bureau of Standards, Circular 429. Price, 10 cents.

Polarimetry, Saccharimetry, and the Sugars, by Frederick J. Bates and associates. National Bureau of Standards, Circular 440. Price, \$2.

A Glossary of Housing Terms. National Bureau of Standards, Building

The isolation of one science from another must become progressively less and less even though specialization within a science becomes greater and greater. This calls for an increasing breadth of culture and of education among scientists, and increasing dedication by the noblest minds to the forward march of knowledge. For, in the free world to which we still dare to look forward, we shall not need only soldiers but statesmen, artists as well as philosophers, priests, and true scientists. The scientists will recognize that man cannot live by scientific bread alone, that integration of his scientific skills with the social and spiritual aspects of human life is essential for the full life."

Materials and Structures Report BMS 91. Price, 15 cents.

Mineral Matter in Coal, by George C. Sprunk and H. J. O'Donnell. U. S. Bureau of Mines, Technical Paper 648. Price, 15 cents.

Hydrogenation and Liquefaction of Coal, Part III.—Characterization of Assay Oils, by L. L. Hirst et al. U. S. Bureau of Mines, Technical Paper 646. Price, 10 cents.

Analyses of Illinois Coals. U. S. Bureau of Mines, Technical Paper 641. Price, 30 cents.

Home Insulation with Mineral Products—Conservation of Fuel for War, by Oliver Bowles. U. S. Bureau of Mines, Information Circular 7220. Mimeographed.

Lamellar Grading of Powdered Mica, by Foster Fraas and Oliver C. Ralston. U. S. Bureau of Mines, Report of Investigations 3662. Mimeographed.

Productivity of Oil Wells and Inherent Influence of Gas:Oil Ratios and Water Saturation, by R. V. Higgins. U. S. Bureau of Mines, Report of Investigations 3657. Mimeographed.

Tin deposits of Irish Creek, Virginia, by A. H. Koachmann, J. J. Glass, and J. S. Vhay. U. S. Geological Survey, Bulletin 936-K. Price, 10 cents.

Manganese Resources of the Olympic Peninsula, Washington, by Charles F. Park, Jr. U. S. Geological Survey, Bulletin 931-R. Price, 35 cents.

Minerals Yearbook. The Bureau of Mines is issuing, but will not be allowed to distribute, Minerals Yearbook 1941 because it contains 14 chapters which for military reasons are restricted in distribution. Pamphlets will be issued for the other chapters which do not include data of comparable military significance. When the military need for secrecy has passed, the bound volumes are to be available for general sale through the Superintendent of Documents. Those requiring information from the chapters of this volume may order the pamphlets, usually at 5 cents each. The following chapters are, however, restricted and will NOT be available: Aluminum and bauxite, antimony, asbestos, chromium, magnesium, manganese, mercury, mica, molybdenum and vanadium, nickel, platinum and allied metals, tin, tungsten, and helium.

Federal Specifications. The following Federal Specifications have recently been issued and are available from the Superintendent of Documents at 5 cents each. L-C-166, Cellulose; absorbent, surgical. O-I-541, Insecticide; liquid (fly-spray). P-W-158, Wax, general-purpose; solvent-type, liquid and paste (for floors, furniture, etc.). LLL-L-359, Linoleum; inlaid and molded. LLL-L-367, Linoleum; plain, jasper and marbleized.

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Recent Books and Pamphlets

The Surface Area of Colloidal Carbons. Published by Columbia Carbon Co., New York, N. Y. 96 pages. Third volume of the series "Columbian Activated Carbons." Gives results of newly completed research on measurement of colloidal carbon. Part I describes measurement by the electron microscope and Part II discusses the role of surface area in rubber reinforcement.

X-Rays in Research and Industry. By H. Hirst. Published by Tait Publishing Co., Melbourne, Australia. 96 pages. Price 5 s. Production and properties of X-rays, structure of crystals and methods of crystallographic examination. More than half of the discussion is devoted to applications of X-ray methods and industrial radiography.

Marketing Mineral Pigments. By C. L. Harness. Information Circular 7217, U. S. Bureau of Mines, Washington, D. C. A survey of the mineral pigment industry. Includes composition, occurrence, methods of treatment, prices, buyers, and census data.

Annual Report for the Year 1941. Colorado Bureau of Mines, Denver, Colo. 52 pages. Production statistics, lists of operating mines, and mine accidents are reported.

Standards of Heat Exchange Institute, Non-Deaerating Heater Section. Published by Heat Exchange Institute, New York, N. Y. 12 pages. Price 75 cents. Nomenclature, definitions, types and standards of construction, rating standards and guarantees, accessories, and a typical specification.

Two American Standards, one governing requirements for installation of gas-burning equipment in power boilers (ASA No.: Z21.33-1942), and the other governing listing requirements for gas valves (ASA No.: Z21.15-1942) have been approved by the American Standards Association, New York, N. Y.

The Value of Gasoline for Gas Making Purposes. By W. H. Ganley and R. W. Stafford. Distributed by Connelly Iron Sponge & Governor Co., Chicago, and Falley Petroleum Co., Chicago. 8 pages. An operating study in which the data indicate, among other conclusions, that raw gasoline can be successfully gasified in a carburetted water gas machine.

Standard Code for Testing Hot Water Unit Heaters. Published by Industrial Unit Heater Association, Detroit, Mich. 12 pages. Gratis. Definitions, rating, tests, equipment for testing, test procedure and computation of results.

List of American Standards for 1942. Published by American Standards Association, New York, N. Y. Gratis. More than 550 Standards are listed, of which 71 are new or revised. Two important headings are American Safety Standards and American War Standards.

Conservation Practice. Published by American Paper and Pulp Association, New York, N. Y. A series of 19 bulletins prepared to help the pulp and paper industry conserve the life of equipment. Contains many helpful suggestions applicable to other industries. Among such subjects are: rubber belting, electrical equipment, conveyors, boiler equipment and accessories, conservation of fuel, salvage and scrap, metals maintenance and conservation.

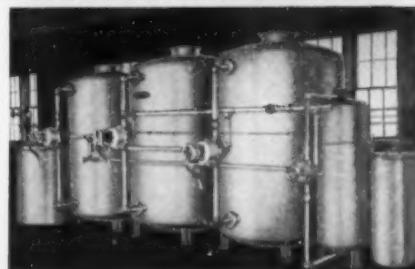
Classified Directory, Seventh Edition. Published by Association of Consulting Chemists and Chemical Engineers, New York, N. Y. 73 pages. A directory of association members. The list now contains the names of 68 members and describes the services they are prepared to offer.

The Work Book of Organic Chemistry. By E. F. Degering. Published by Barnes & Noble, New York, N. Y. 256 pages. Price \$1.25. To be used in conjunction with beginning courses in organic chemistry. Each chapter contains a review summary, fill-in review questions, and objective tests.

Telephone Directory for National War Agencies. This is now printed commercially and can be bought from National Capital Press, Inc., 301 N Street, N. E., Washington, D. C. Single copies are thirty cents. Bulk sales are at slightly lower rates.

New Chemical Method of De-salting Water

Replaces
**DISTILLED
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Typical ILLCO-WAY installation
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● This modern, economical method is daily meeting the exacting standards of industrial and technical concerns requiring purified water.

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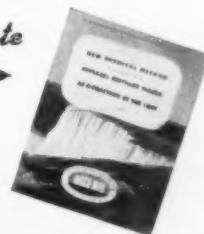
● The process replaces distilled water in aircraft factories, pharmaceutical houses, mirror and ceramic plants, distilleries and the numerous process industries.

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That scraper edge on the Bates open steel flooring cross bar is cleaner and safer. You grasp the idea from even a quick glance at the picture. Yet it doesn't cost you a cent more.

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OPEN STEEL FLOORING • STAIR TREADS

MANUFACTURERS' LATEST PUBLICATIONS

Publications listed here are available from the manufacturers themselves, without cost unless a price is specifically mentioned. To limit the circulation of their literature to responsible engineers, production men and industrial executives, manufacturers usually specify that requests be made on business letterhead.

Compressors—B. F. Sturtevant Co., Hyde Park, Boston, Mass.—Catalog 3862—20-page catalog illustrating and describing very briefly the line of centrifugal compressors, design 9, put out by this concern. Gives descriptive data, performance tables, dimension diagrams, unit and installation photographs.

Control Instruments—Allen-Bradley Co., 1311 S. First St., Milwaukee, Wis.—Bulletin 836—8-page booklet describing this concern's line of pressure and temperature controls. Suggests methods of application, such as for pilot plants, operation of contactors, or for direct control of small a-c and d-c motors.

Control Instruments—The Brown Instrument Co., Wayne and Roberts Ave., Philadelphia, Pa.—Bulletin 801—62-page catalog entitled "The Technique of Precision Control in Industrial Processes." Discusses precision measurement, fundamentals of control, types of control, control valves and typical applications. Includes many illustrations and schematic diagrams of basic control systems. Various units are illustrated.

Control Instruments—Wheelco Instrument Co., 825 W. Harrison St., Chicago, Ill.—Bulletin Z6100—16-page condensed listing of this company's complete line of measuring and control instruments. Unit construction of temperature controllers is described and illustrated. Also covers the company's "electronic principle," remote controllers, combustion safeguard equipment and other instruments.

Copper Alloys—Revere Copper & Brass, Inc., 230 Park Ave., New York, N. Y.—New guide book designed to give information on the copper and copper alloys put out by this concern. Organized for easy reference and gives information on the technology and properties of copper and copper base alloys, welding technique, specifications, manufactured forms, pipe and tube dimensions and weights, etc.

Doors and Grilles—Cornell Iron Works, Inc., 36th Ave. at 13th St., Long Island City, N. Y.—8-page booklet describing and illustrating this concern's line of upward acting doors, in wood and metal, rolling steel grilles, and sliding grilles. Includes information on recent designs which substitute wood for critical metals. Extensively illustrated by sketches and installation photographs.

Dust Control—American Air Filter Co., Inc., Louisville, Ky.—32-page catalog dealing with air filtration and dust control in industry. Discusses industrial dust problems, atmospheric dust, process dust; filtered air for industrial air conditioning, drying operations, product finishing, miscellaneous industrial applications and control of process dust. Extensively illustrated by schematic drawings and halftone reproductions. Contains considerable engineering information.

Electrical Equipment—Roller-Smith Co., Bethlehem, Pa.—Catalog 1110—12 page catalog dealing with the metal-clad switchgear of various capacities and volts put out by this concern. Illustrates and discusses outstanding features and applications of each of the units, includes diagrammatic drawings, layout plans, and tables of dimensions.

Fire Extinguishers—Pyrene Mfg. Co., 560 Belmont Ave., Newark, N. J.—6-page folder dealing with the maintenance of fire extinguishers and giving specific directions for inspecting, recharging and maintaining portable fire extinguishers. Well organized and written in simple language. Illustrated.

Foundry Practice—Robins Conveying Belt Co., Passaic, N. J.—Bulletin 124—

8-page booklet illustrating and describing briefly this concern's line of full-floating foundry shakeouts. Discusses principles of the shakeouts, their advantages, and other features.

Heat Treatment—The Selas Co., Erie Ave. and D St., Philadelphia, Pa.—Series 5—14-page catalog dealing with the subject of heat treatment without furnaces, an interpretation of new selective heat treating methods using gas-air fuel supply. Discusses machine tools for heat treatment, accelerating heat transfer, new types of refractory gas-air burners, and other topics. Illustrated.

High Vacuum Gages—F. J. Stokes Machine Co., Olney Post Office, Philadelphia, Pa.—Bulletin 42G—4-page folder describing briefly and illustrating this concern's improved model high vacuum gages for use either as portable instruments or on fixed mountings. Contains complete description of gages, specifications and prices. Extensively illustrated.

Laboratory Glassware—Corning Glass Works, Corning, N. Y.—Catalog LP21, supplement 1—16-page supplementary catalog listing new items in "Pyrex" laboratory glassware, including this concern's "Lifetime Red" low actinic glassware. Also includes items of this concern's alkali resistant (boron-free) glassware. Each unit is illustrated and described briefly. Includes data on capacities, dimensions, and list prices.

Manometers—Taylor Instrument Companies, Rochester, N. Y.—Bulletin 98160—Bulletin illustrating and describing briefly this concern's new "Mercuryless" manometer for measuring and controlling rate of flow and liquid level, especially for highly volatile and corrosive fluids. Describes briefly use in manufacture of butadiene, styrene, high-octane gasoline, etc.

Metal Cleaning—Hercules Powder Co., Wilmington, Del.—Booklet describing uses of this concern's "Dresinate," the neutral sodium salt of selected resins, for metal cleaning compounds. Photographs compare the action of the material on metal with that of other standard cleaners. Since supplies are available without priority restrictions, use of this material has been suggested in place of certain chlorinated solvents.

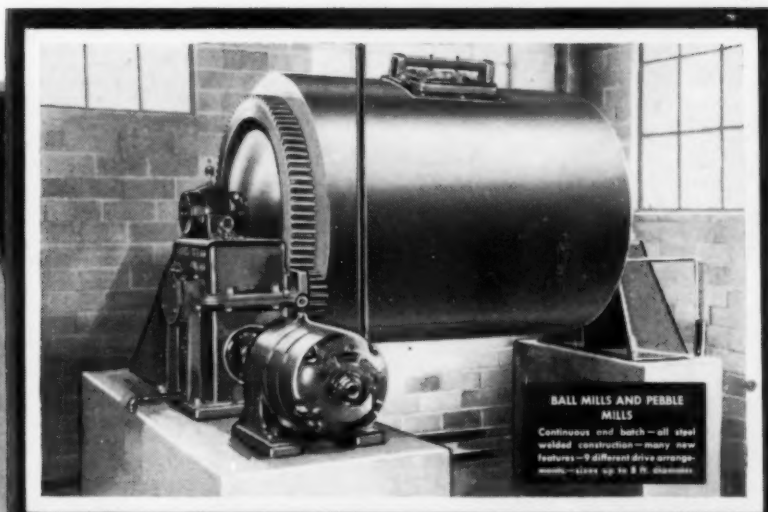
Mixers—Robinson Mfg. Co., 30 Church St., New York, N. Y.—Bulletin 300—6-page form illustrating and describing briefly this concern's line of equipment for the process industries, including mixers, sifters, cutters, crushers, grinders, hammermills, pulverizers and rubber reclaiming equipment. Each unit is illustrated.

Molding Presses—F. J. Stokes Machine Co., Tabor Road, Olney Post Office, Philadelphia, Pa.—Catalog 427—16-page catalog illustrating and describing briefly this concern's line of "Standard" semi-automatic molding presses and preforming presses. Contains tables of specifications and numerous installation photographs.

Motor Selector—Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Handy, reinforced cardboard "motor finder" to aid in quickly selecting various types of squirrel-cage motors. Extremely simple to operate and requires only three simple steps to pick a motor.

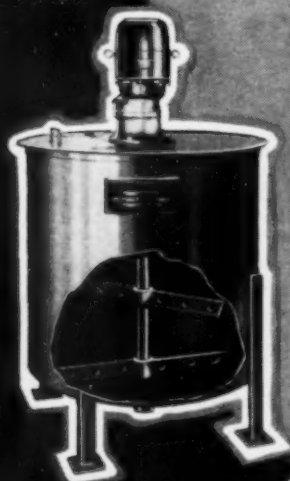
Oil Burners—Hauck Mfg. Co., 124-136 Tenth St., Brooklyn, N. Y.—16-page catalog on this concern's proportioning oil burner for precision control of temperature and atmosphere in all heating applications. Gives information regarding the unit together with diagrams for automatic control hookup, burner capacities, dimensions, automatic control data, etc. Extensively illustrated by charts, schematic drawings and halftone.

Paper for War Industry—Byron



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MODERN MIXING AND PROCESSING EQUIPMENT



INTERNATIONAL TYPE "O" MIXERS

INTERNATIONAL PERMANENT MIXERS

Direct drive or gear drive, in large, medium and small capacities.

INTERNATIONAL PORTABLE MIXERS

Heavy and Medium Duty, with and without outboard bearings; Construction of modern design and in many different types.



INTERNATIONAL SIDE ENTRANCE MIXERS

Furnished in sizes from 1/2 H. P. to 25 H. P.



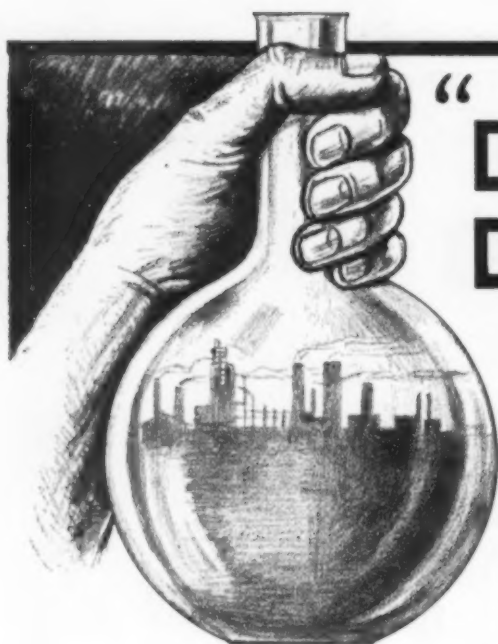
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KETTLES —
AUTOCLAVES
DIGESTERS
BLENTERS —



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DAYTON, OHIO



“DREAMS DO COME TRUE”

A dream in a test tube becomes a preferred product tomorrow. Every worth-while invention or improvement on an existing process is the fruit of some thinker's dream. Constant thought and experimentation pay dividends.

Furfural

has made reality of many dreams. What better example is there than the oil refining industry, where Furfural is used as the selective solvent to remove the unsaturated and sludge-forming entities from tremendous quantities of high grade lubricating oil. Consider also the plastics industry, where Furfural is condensed with phenol or other materials to form resins of superior properties. As a preservative, dye solvent, and paint remover it does its job well. Let us tell you how Furfural may help you. Typical properties of the regular grade are as follows:

| | |
|-------------------------------|-----------------------|
| Color | Straw yellow to amber |
| Boiling point | 157-167° C. (99%) |
| Specific gravity (20/20)..... | 1.161 |
| Freezing point | -37°C. |
| Flash point (open cup)..... | 56°C. |
| Refractive index (20/D)..... | 1.5261 |

The Quaker Oats Company

TECHNICAL DIVISION 512 CHICAGO, ILLINOIS

**FURFURAL - FURFURYL ALCOHOL - HYDROFURAMIDE
... TETRAHYDROFURFURYL ALCOHOL ...**

The Furans

**FURFURAL
FURFURYL ALCOHOL
TETRAHYDROFURFURYL
ALCOHOL
HYDROFURAMIDE**

Write for this
Free Booklet



Weston Co., Dalton, Mass.—16-page, spiral-bound booklet giving a presentation of the laboratory and production facilities of this concern. Discusses present range of product test values, manufacturing and technical facilities, testing basic paper qualities, etc. Illustrated.

Power Transmission—The American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa.—Catalog ED42—36-page catalog dealing with this concern's "Econ-O-Matic" drive. Describes and illustrates each of the drives, gives important operating benefits and economics. Includes flat-belt drives, V-belt drives, etc. Contains extensive tables on drive selection, dimensions, and list prices.

Pumps—Blackmer Pump Co., Grand Rapids, Mich.—Bulletin 115—4-page form illustrating and describing briefly this concern's line of sanitary pumps used in food and beverage processing plants, etc. Contains tables of specifications.

Raw Materials for Synthetic Rubber—Mellon Institute of Industrial Research, Pittsburgh, Pa.—12-page booklet entitled "Storage and Handling of Butadiene, Isobutylene, Styrene and Acrylonitrile." Gives extensive information on storage and handling of these raw materials for synthetic rubber manufacture. Includes tabulation of physical properties, design of storage containers, chemical properties, annual operating costs for storing, filling refrigerating costs, corrosive effects of container materials, physiological effects, etc. Extensively illustrated by charts and drawings. Well organized and full of engineering data.

Refractories. The Carborundum Co., Refractory Division, Perth Amboy, N. J.—8-page booklet entitled "Super Refractories for the Process Industries." Includes in chart and illustrative form the physical characteristics of various refractories. Also illustrates and discusses briefly the use of refractories in protected boiler setting, gas generator, muriatic acid furnace, still setting, multiple hearth muffled furnace, rabble blades, retorts for zinc ore reduction, and retorts for producing carbon dioxide.

Screens. Robbins Conveying Belt Co., Passaic, N. J.—Bulletin 123—8-page booklet dealing with the line of vibrating screens for liquids put out by this concern. Each unit is illustrated and described briefly. Includes information on actual applications of liquid screens and dimensions of the standard type.

Stainless Steels. Electro Metallurgical Co., 30 East 42nd St., New York, N. Y.—Form 5201—12-page booklet dealing with stainless steels in process industries. Includes reprints of two articles entitled "Stainless Steel Developments in Process Industries" and "Austenitic Stainless Steels in Process Industries." Illustrated.

Steel. Falstrom Co., Passaic, N. J.—4-page folder illustrating and describing very briefly this concern's line of fabricated metal products for all industries. Also 4-page folder discussing the concern's line of seamless steel tubing of standard and special shapes. Illustrated.

Stoker Coal Crushers. McNally Pittsburg Mfg. Corp., 307 N. Michigan Ave., Chicago, Ill.—Bulletin 442—8-page bulletin illustrating and describing briefly the line of stoker coal crushers put out by this concern. Illustrates a two-stage coal crushing circuit with drawings, features and crushing recommendations, as well as capacities, dimension tables, plus test results on different coals.

Synthetic Rubber Manufacture. General Electric Co., Schenectady, N. Y.—Bulletin GES3016—50-page, spiral bound notebook dealing with electric equipment for synthetic rubber production. Contains generalized flow charts illustrating the functions of electric equipment in butadiene, styrene and polymerization processes, turbines, turbine-generators and power generation equipment, load center systems and other means of power distribution, mechanical-drive turbines, motor and process controls and other

cylinders, round rods, square rods and other shape rods and tubes.

Power Piping. Blaw-Knox Co., Power Piping Division, 1525 Pennsylvania Ave., Pittsburgh, Pa.—Bulletin 1863—20-page bulletin entitled "Power Piping. Functional Hangers and Vibration Eliminators." Contains discussions and illustrations of types and characteristics of power piping functional type hangers and vibration eliminators, together with information on employment of vibration eliminators. Illustrated by diagrammatic drawings, installation photographs and charts.

Precision Balances. Roller-Smith Co., Bethlehem, Pa.—Catalog 4550—4-page form dealing with this concern's Models B-1 double hook and MB single hook and double hook precision balances in sizes for weights ranging from less than 3 mg. to more than 50 gm. Construction, beams, other accessories and accuracy are discussed and the unit is illustrated. Contains a price list of attachments.

Processing Machinery. Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Form B6177A—12-page catalog of basic machinery for the processing industries put out by this concern. Contains photographic illustrations, diagrams of operating principles and lists features, sizes and capacities of units widely applied in this field. Describes crushing, grinding and milling type reduction, mechanical separation, washing, etc. Each unit is illustrated.

Pumps. Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Bulletin B-6059H—8-page catalog giving very compact data on the line of centrifugal pumps put out by this concern. Concise descriptions, charts, diagrams, as well as construction features, sizes and capacities make the booklet useful. Well illustrated by cross-sectional drawings and photographs.

Pumps. Traydon Engineering Corp., 1814 E. 40th St., Cleveland, Ohio—Bulletin 425—4-page folder which illustrates and describes briefly this concern's electric-hydraulic barrel pumps. Includes a discussion of the advantages and operation of the pumps, specifications and cross-sectional drawings.

Thermocouple Pyrometers. Leeds & Northrup Co., 4907 Stenton Ave., Philadelphia, Pa.—Catalog N33A—55-page catalog dealing with the line of Micro-max thermocouple pyrometers put out by this concern. It contains information on indicators, recorders and controllers, and thermocouples and accessories used with them. Extensively illustrated by drawings, photographs and charts.

Valve Repairing. The Crane Co., 836 S. Michigan Ave., Chicago, Ill.—Bulletin 5—6-page folder explaining and illustrating how to repair valves for conserving metals and for getting renewed life from gate and globe valves. Numerous illustrations show the proper technique of valve repair.

V-Belt Drives. Allis-Chalmers Mfg. Co., Milwaukee, Wis.—Bulletin B6051C—12-page bulletin on selection of correct V-Belt drives for war-time applications. Includes extensive engineering data in simplified chart and table form and also includes list prices, stock sizes, dimensions and construction details. Well illustrated with diagrammatic drawings.

Water Analyses. W. H. & L. D. Betz, Laboratory Supply Division, Gillingham and Worth Sts., Frankford, Philadelphia, Pa.—20-page booklet dealing with this concern's line of apparatus and chemicals for water analyses, including test sets, comparators, chlorimeters, pH meters, burettes, glassware, etc. Includes a price list and numerous illustrations.

Women Workers. Allis-Chalmers Mfg. Co., Milwaukee, Wis.—A new health and safety manual devoted exclusively to the problems of women in industry. Includes a section devoted to the proper attire for women in the shop, safety clothing designed from existing slack suits, proper exercises necessary for maintenance of good physical condition, hazards to be avoided in various occupations, etc. Includes line drawings and photographs.

Make your "ON GUARD" Equipment Last Longer

WRIGHT Improved High-Speed HOISTS

Too often the hoist that is on stand-by duty—"on guard" for instant action in case of emergency—is neglected by the maintenance man. Don't neglect your hoists. Make them last longer by regular and proper maintenance. Here are a few suggestions:

Put the Grease Gun to Work!

A WRIGHT HOIST needs thorough lubrication once a month. Keep the load chain well-lubricated, too.

Don't Overload Your Hoist.

While WRIGHTS are famous for their ability to stand abuse, this is no time to abuse machinery. Overloading results in a stretched chain which cannot seat itself properly in sheave pockets, thus accelerating wear.

Watch the Load Hook.

WRIGHT hooks, drop-forged from special steel, give visible warning of overloading by slowly opening. Don't continue to use hooks that have stretched.

Inspect Your Hoists Regularly.

Where properly maintained, WRIGHT HOISTS have given continuous, trouble-free service for 20 to 25 years. Just to summarize—remember—

- ★ Don't forget the grease gun
- ★ Don't overload your hoists
- ★ Watch the load hook
- ★ Inspect your hoists regularly

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SMALL LOUISVILLE DRYER PAYS FOR ITSELF IN SEVEN MONTHS!

This is the story of a manufacturer who uses a moisture-absorbing agent in his production process. During the process the material becomes wet, lumpy, and "unfit for further use." So until a Louisville engineer proved that a Louisville Dryer could reclaim the wetted agent at about one-eighth of the replacement cost, it was simply hauled to the dump and thrown away. . . .

No, this isn't a "big story." The yearly savings of the dryer amount to only some \$7,700—and the Louisville Dryer itself cost only \$4100. But it is typical of what

PROBLEM

To develop a drying system for reclaiming wet processing material that was formerly thrown away.

SOLUTION

A Louisville Rotary Dryer operating at a total cost of \$4.20 per day, including fixed charges, reclaims \$30 worth of material per day.

RESULT

\$4,100 Louisville Rotary Dryer pays for itself, every seven months.

can often be done with really efficient rotary drying, in even small operations. . . .

Why don't *you* investigate the possibilities? To solve drying problems of any sort, and to obtain definite cost and performance data, Louisville Drying maintains complete laboratories and pilot plants which enable us to give you fast, *accurate* advice and recommendations. Send us samples of your wet materials and we'll do the rest. *Address:* Louisville Drying Machinery Co., *Incorporated*, 451 Baxter Avenue, Louisville, Kentucky.

RISE IN ACTIVITIES AT FERTILIZER AND STEEL PLANTS INCREASES DEMAND FOR CHEMICALS

INDUSTRIAL output continues to move up sharply and the seasonally adjusted index of the Federal Reserve Board for October rose to 188. Production of war goods makes up well over 50 percent of this total and it is estimated that about 80 percent of non-durable goods produced is of a type essential to the war effort. Because of the almost universal use of chemicals in manufacturing, these figures indirectly are a report of activity within the chemical industry. While the regulation of critical materials into direct war-production channels has necessarily forced some curtailment in civilian production, the index for consumption of chemicals in the so-called civilian lines has again turned upward. This has been caused largely by larger outputs of superphosphate and by a record rate of operations at steel mills. The *Chem. & Met.* index for chemical consumption in October is 172.37 as against

**Chem. & Met. Index for Industrial
Consumption of Chemicals**
1935=100

| | September | October |
|--------------------------|---------------|---------------|
| Fertilizers | 40.22 | 36.99 |
| Pulp and paper..... | 19.06 | 20.55 |
| Petroleum refining.... | 14.70 | 15.21 |
| Glass | 15.30 | 15.70 |
| Paint and varnish.... | 13.97 | 14.32 |
| Iron and steel..... | 12.99 | 13.81 |
| Rayon | 14.89 | 15.20 |
| Textiles | 12.00 | 12.32 |
| Coal products..... | 9.39 | 9.68 |
| Leather | 4.70 | 4.95 |
| Industrial explosives... | 6.21 | 6.04 |
| Rubber | 3.00 | 3.00 |
| Plastics | 4.45 | 4.60 |
| | 170.88 | 172.37 |

a revised number of 170.85 for September. In 1941 the index numbers were 162.60 and 171.48 for September and October respectively.

The fact that the majority of chemicals have been moving steadily to consumers with very little surplus stocks has shown that production and consumption were in close harmony. Peak production is a term which has been used frequently when referring to chemicals yet it is admitted that near-future demands will be larger than ever and chemical outputs next year must be stepped up considerably above the record level set in the current year. Just where a saturation point will be reached is difficult to determine but with enlarged programs for production of munitions, ships tanks, planes, and a large synthetic rubber program to take care of, it is apparent that larger amounts of chemicals must be made available.

Further limitations placed on production of civilian goods will release a certain amount of raw materials for more essential end products but the industries which are most prominent in consuming chemicals likewise are the ones which produce goods of an essential nature. In the case of fertilizers, the importance of an ample

food supply offers sufficient reason for expecting a larger use of fertilizers. Pulp and paper outputs have come under regulation and will not reach the levels maintained in the latter part of 1941 and the early part of this year. Manufacturers of woolen and rayon textiles must operate at a high rate to fill war orders and cotton mills are expected to need about 10 percent of their output next year to fill Lend-Lease requirements. With more than half of production required for military purposes and with the bag goods program taking as much as Lend-Lease, there can be no reduction in cotton mill rates. The outlook for paint and varnish is less favorable and 1943 requirements promise to fall below those of the present year.

Some of the chemicals which are in limited supply and for which steps will be taken to enlarge outputs were mentioned at the first meeting of the Chemical Plant Facilities Industry Advisory Committee.

Information was sought from the committee on present facilities which might be adapted for conversion to the rapid manufacture of various chemicals including ethyl cellulose, ethyl alcohol, dibutyl amine, diethyl amine, ethyl aniline, furfural, mannitol, sorbitol, monochlor benzene, phenol, thiokol, triacetin, tricresyl phosphate, triethyl phosphate, acetanilid, aluminum chloride, calcium carbide, calcium hypochlorite, dichlorethyl ether, silica gel, acrylonitrile, polyvinyl formaldehyde resins and carbon black.

The committee will act as the representative for the entire chemical industry in advising the Chemicals Division of the War Production Board on problems of chemical manufacture. A primary consideration will be the concentration of present facilities wherever possible in an attempt to conserve money, materials, manpower and time.

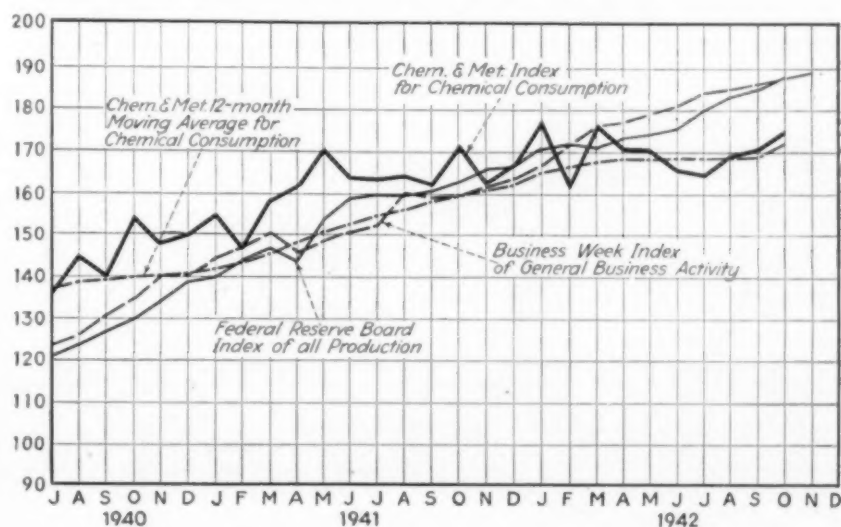
Demand for ethyl cellulose at the present time is four times greater than the supply, the committee members

CHEM & MET ECONOMICS & MARKETS

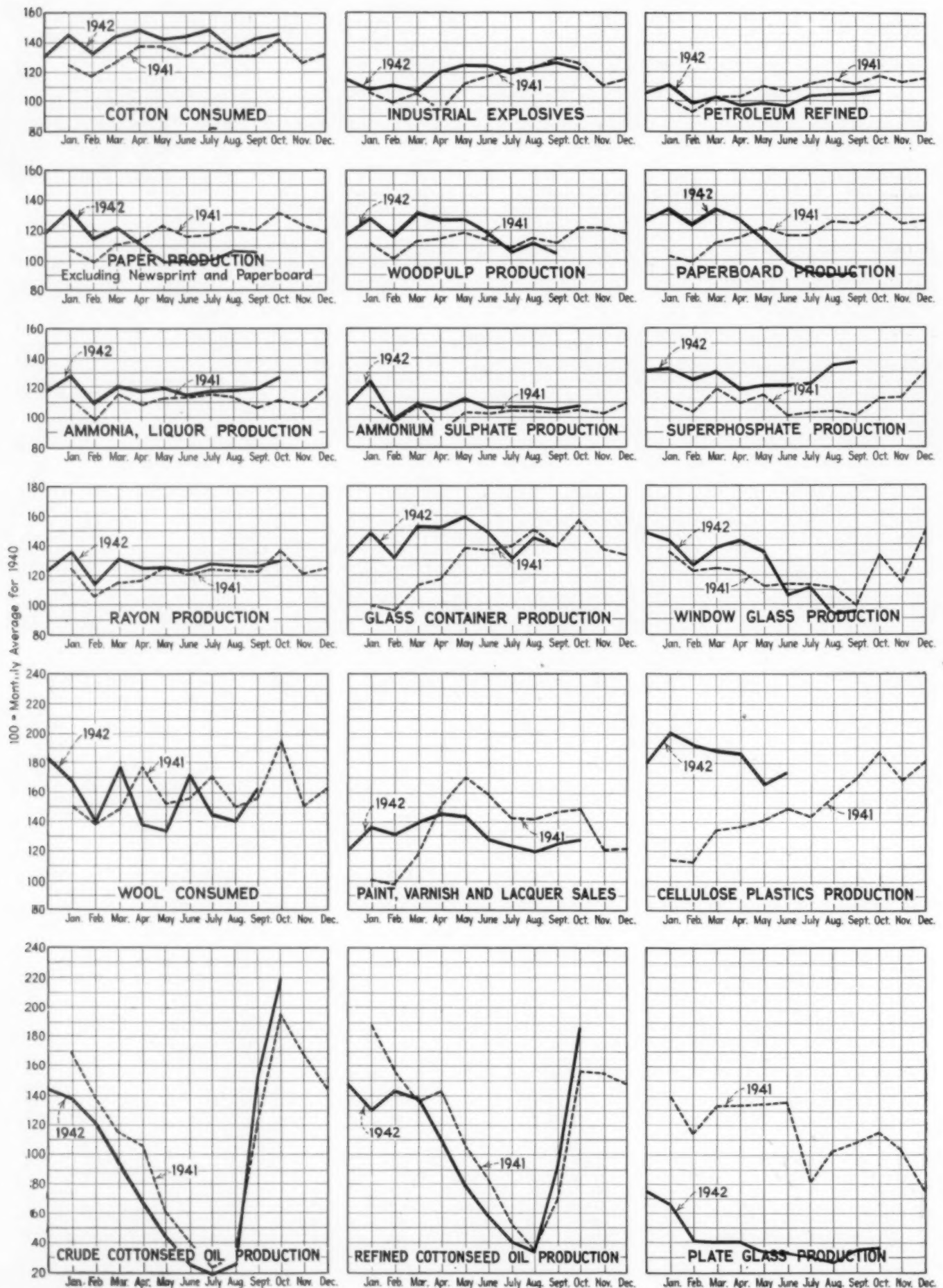
were told, and may continue to increase as a result of experiments now being made by the United States Army and Navy. There is a need for one million more pounds of ethyl cellulose a month, the Protective Coatings Section stated, and it would like to aim at an increased production of a million and a half more pounds a month.

The problem involved concerns equipment. Elaborate chemical autoclaves are necessary for the production of ethyl cellulose and these have been made of nickel to resist chemical corrosion. It was suggested by the committee that silver might be substituted for nickel, since it is not as critical a material, and might possess adequate resistance to the process.

In spite of the record domestic crop of oil seeds and hogs, and in spite of the improvement in the household fat salvage program which at last is now gathering momentum, fats and oils remain in great demand. Indicative of the situation was the action of the War Production Board in setting high standards of production efficiency in glycerine recovery for the soap, fat splitting and glycerine refining industries. Order M-193 in which the efficiency standards for glycerine are set forth is much more severe than M-60 for cocoanut oil and M-59 for palm oil. M-193 went into effect December 1. It is a part of the broad campaign to preserve and increase the glycerine supply of the country.



Production and Consumption Trends



ARMSTRONG'S FOAMGLAS INSULATION AVAILABLE FOR PROMPT DELIVERY



New fireproof, vaporproof insulation for low temperatures meets many requirements

ARMSTRONG'S Foamglas is available now for prompt delivery. It can be furnished for low temperature insulation construction with or without a priority rating.

This new form of glass is entirely made up of sealed cells. This cellular structure makes Foamglas light, strong, and effective for heat insulation. Each sealed cell is under a slight vacuum, thus increasing its insulating efficiency.

Foamglas is unique in the qualities it offers for service in the low temperature field. Look at all these advantages:

Moistureproof: Foamglas is not only waterproof, but even more important, it is vaporproof. No airborne moisture can get into or through this insulation. Being glass, Foamglas will keep its original insulating value *permanently*.

Structurally strong: Foamglas

has a compressive strength of 130 lbs. per sq. inch. It has a wide range of possibilities for use where both insulating value and structural strength are important.

Fireproof: Foamglas is glass—it will not burn.

Permanent: Foamglas is proof against all common forms of deterioration. It is also verminproof and odorless.

Easy to erect: Strong, rigid, light in weight, Foamglas can be sawed and worked with ordinary tools.

Convenient size: Foamglas is

made in one size, 12" x 18". Thicknesses available are 2", 3", and 4½".

Readily available: Foamglas is not made of critical materials; thus it can be supplied in quantity for both priority and non-priority work.

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Whether or not you're planning insulated construction now, get full facts about this new, permanent addition to the Armstrong Line of quality insulating materials. A new, illustrated booklet has a brief table of properties. Write for your free

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*Reg. U. S. Pat. Off. O.-C. F. Corp.

MONARCH CORROSION RESISTANT NOZZLES

of

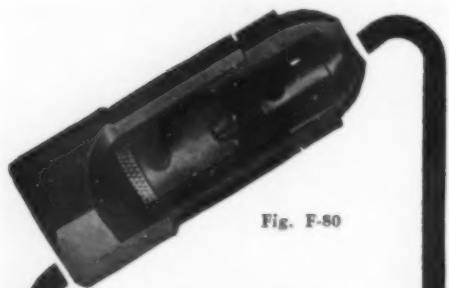


Fig. F-80

STAINLESS STEEL:

Available in capacities from .0095 G.P.M. (Fig. F-80 style illustrated) to 104 G.P.M. (Fig. B-8-A style).

"Hollow" cone, "Solid" cone, and "Flat" sprays furnished in pipe sizes and capacities to suit practically any problem where corrosive liquids are sprayed.

STONEWARE:

Monarch Fig. 6020 and Fig. 6040 stoneware sprays have replaced most other types of nozzles used in acid chamber plants throughout the world. Last almost indefinitely in sulfur gases and will not break or crack from temperature changes.

HARD RUBBER:

Patented Fig. B-27 nozzle is of the "non-clog" type; i. e. it contains no internal vanes, slots, or deflectors which might facilitate clogging. Available $\frac{1}{4}$ " to 1" pipe. Small sizes produce a very fine, soft, wide angle hollow cone spray, even at low pressures.

Fig. H-407 "flat" spray produces a relatively fine even sheet of liquid.

Write for
Catalogs 6A and 6C

MONARCH MFG. WKS., INC.

2730 E. WESTMORELAND ST.
PHILADELPHIA, PA.

EXCHANGE ESTABLISHED AT NEW YORK TO AID IN SECURING CHEMICALS NEEDED FOR WAR WORK

WHAT HAS been referred to as an informal exchange has been set up in the New York offices of WPB to remedy emergency situations where there is interference with important war work because of lack of certain chemicals and to obtain a clearer idea of the extent and types of chemical shortages. This is not an attempt on the part of a government agency to take over the marketing of chemicals but rather a service to furnish information regarding sources of supply and quantities available of chemicals which are in small supply and which are highly important in turning out finished products important in the war effort. This is an aftermath of the request which was made about two months ago whereby distributors of chemicals in the metropolitan area were asked to report on their inventories.

Despite the lowering of outputs in some civilian-goods lines, overall demand for chemicals has been gaining which is keeping production at peak levels with new records to follow as new plant capacity is completed. The progress of synthetic rubber production is being followed closely as this offers a broad outlet for chemicals. In some cases a fairly accurate idea is possible regarding the amounts of chemicals to be used but it is held that considerable experimentation will be carried out by these rubber manufacturers with a shifting in the type of chemicals which are finally found most adaptable.

New government regulations continued to furnish the most important factors governing trading in chemicals and allied products. Effective Dec. 1, mineral oil polymers were put under allocation. Mineral oil polymers is defined as meaning the resinous product produced by the polymerization of mixtures of unsaturated hydrocarbons, either the solid resin or solvent extended product. It does not include polystyrene, polyisobutylene, polyethylene, butadiene, or the other copolymers of such materials. With the exception of monthly deliveries of 50 lb. or less of polymers, the order prohibits the delivery, acceptance, or use of mineral oil polymers from a producer or distributor except as specifically authorized. Primary product must be specified in terms of core oil, insulation material, plastic base, protective coatings, etc.

On Nov. 24, an order was issued forbidding the manufacture and use of tin oxide. Order M-43-a formerly in effect had permitted its use on orders bearing a rating of A-1-k or higher. The new order also limits the amount of tin which may be used in coating for foundry chaplets to five percent or less. In commenting on the order it was stated that tin oxide normally is used in ceramics as an opacifier, as a polishing agent in certain stone work, and for other relatively non-essential

uses for which substitutes are available.

An exception to the control over delivery and use of phenolic resins and phenolic resin molding compounds set up in Order M-246 was provided with issuance of Amendment No. 1. This permits delivery and use during December of phenolic resins and phenolic resin molding compounds which are produced from phenol delivered in accordance with November allocations under M-27, without special authorization under M-246. Since the November allocations of phenol have already been earmarked for specific purposes, it is not considered necessary to control further the distribution or use of phenolic resins and phenolic resins molding compounds produced from them in December.

Two allocation orders, M-169 covering methyl ethyl ketone, and M-159 covering butyl alcohol, were amended to provide for the use of the standard chemical allocations Form PD-600 and PD-601. The action is taken by issuing a completely new version of each order. The purpose of this change is to bring allocation of these two materials into agreement with current allocation procedure and to provide the Chemicals Division with end-use information they needed for a more precise allocation of the chemicals.

Preference rating order P-43, which formerly could be used only by research laboratories, has been revised to permit production control laboratories to qualify and be granted serial numbers. The revised order assigns a rating of AA-2X to qualified serial numbered laboratories for the purchase of any material (including reagent chemicals) except for the construction of laboratory buildings or other structures. However, when the value of any item or quantity of the same item of material exceeds fifty dollars (\$50.00), the rating may not be used unless the purchase is specifically authorized by the Director General for Operations pursuant to application on Form PD-620. Specific authorization is not required for the purchase of any reagent chem-

CHEM. & MET.

Weight Index of CHEMICAL PRICES

Base=100 for 1937

| | |
|----------------|--------|
| This month | 108.92 |
| Last month | 108.94 |
| December, 1941 | 103.85 |
| December, 1940 | 99.64 |

Long-term contracts may be made for formaldehyde, lithopone, titanium pigments, and acetic acid. The prices at time of delivery to be no higher than the maximum prices then in effect. This was effected by amending the maximum price regulation of OPA which went into effect on Dec. 2.

icals irrespective of whether the value is less than, or exceeds fifty dollars (\$50.00).

The revised order also assigns a rating of AA-4 for the purchase of any laboratory equipment which is authorized by the Director General for Operations under paragraph (b) (2) (vi) of Limitation Order L-144, pursuant to application on Form PD-620.

The unrestricted sale of rubbing alcohol and rubbing alcohol compounds was forbidden by Amendment No. 2 to General Preference Order M-30. Under the existing order, deliveries of rubbing alcohol were limited to 70 percent of those in the corresponding calendar quarter of the base period (July 1, 1940, to June 30, 1941). The amendment forbids the delivery of any ethyl alcohol or any compound containing it for use as rubbing alcohol except to licensed physicians, dentists and veterinarians; holders of written doctor's prescription or orders; wholesalers, retailers and manufacturers for resale in accordance with the terms of this order; and to certain government agencies. The action is expected to save nearly 2,000,000 gallons yearly.

Regulations affecting prices included an amendment whereby adjustable pricing is permitted for sales of formaldehyde, lithopone, titanium pigments, and acetic acid. This was to safeguard against a shifting cost situation with resulting changes in price structure tended to make long-term contracts risky without the provision for adjustable pricing which permits the buyer and seller to agree to fix prices on delivery which are no higher than the maximum prices in effect at that time.

Ceiling prices for plastic screening may be determined by using methods, labor rates, and materials prices in effect March 31, 1942. A maximum price of 10c each for used 100-lb. calcium carbide drums is established effective Nov. 25. New prices for flourspar also were announced except in the Illinois-Kentucky district. For acid-grade flourspar the price is \$32 per short ton for material with a minimum calcium fluoride content of 97½ percent and a maximum silica content of 1½ percent.

CHEM. & MET.

Weighted Index of Prices for OILS & FATS

Base=100 for 1937

| | |
|----------------------|--------|
| This month | 140.89 |
| Last month | 140.27 |
| December, 1941 | 129.80 |
| December, 1940 | 68.94 |

Market quotations for some of the vegetable oils remain largely nominal. Higher prices were permitted on sales of refined cottonseed oil and the market for crude in the southeast was reported at 12¼c a lb. Demand for linseed oil has slowed down and the price was lower.

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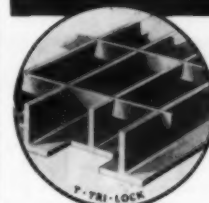
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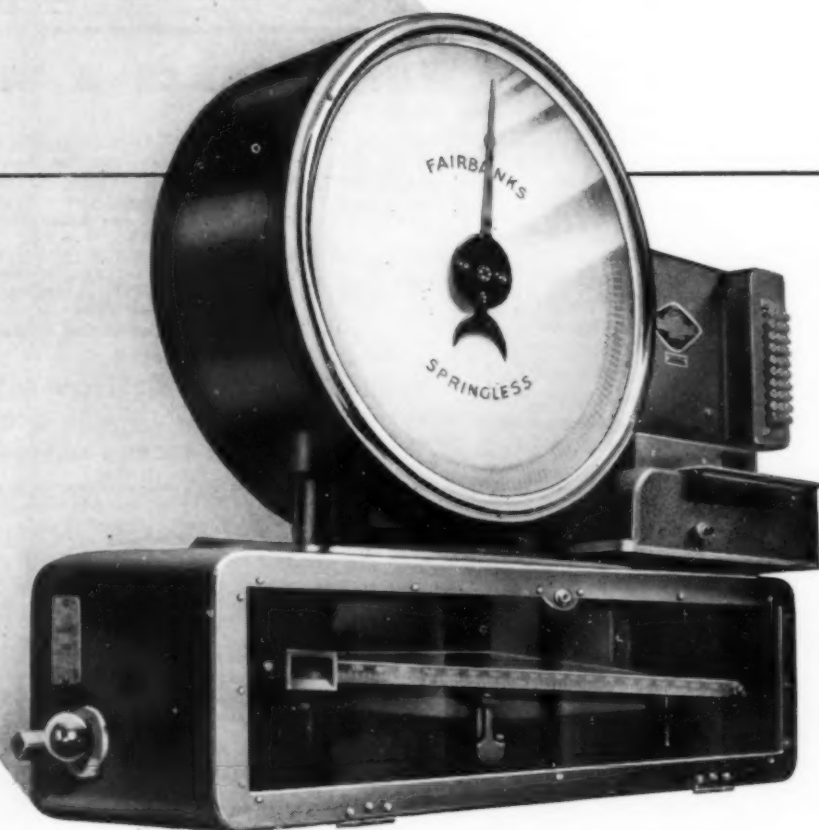
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**SCALES
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INDUSTRIAL CHEMICALS

| | Current Price | Last Month | Last Year |
|---|-----------------|-----------------|----------------|
| Acetone, drums, lb. | \$0.085-\$0.109 | \$0.085-\$0.109 | \$0.085-\$0.09 |
| Acid, acetic, 28%, bbl., cwt. | 3.38 - 3.63 | 3.38 - 3.63 | 3.18 - 3.43 |
| Glacial 99.5%, drums | 9.15 - 9.40 | 9.15 - 9.40 | 8.68 - 10.00 |
| U. S. P. X 1, 99.5%, dr. | 10.95 - 11.20 | 10.95 - 11.20 | 10.50 - 11.00 |
| Boric, bbl., ton. | 109.00-113.00 | 109.00-113.00 | 106.00-111.00 |
| Citric, kegs, lb. | .20 - .23 | .20 - .23 | .20 - .23 |
| Formic, cys., lb. | .10 - .11 | .10 - .11 | .10 - .11 |
| Gallie, tech., bbl., lb. | 1.10 - 1.15 | 1.10 - 1.15 | 1.10 - 1.15 |
| Hydrofluoric 30% drums, lb. | .08 - .08 | .08 - .08 | .08 - .08 |
| Lactic, 44%, tech., light, bbl., lb. | .073 - .075 | .073 - .075 | .073 - .075 |
| Muriatic 18%, tanks, cwt. | 1.05 - . | 1.05 - . | 1.05 - . |
| Nitric, 36%, carboys, lb. | .05 - .05 | .05 - .05 | .05 - .05 |
| Oleum, tanks, wks., ton. | 18.50 - 20.00 | 18.50 - 20.00 | 18.50 - 20.00 |
| Oxalic, crystals, bbl., lb. | .11 - .13 | .11 - .13 | .11 - .13 |
| Phosphoric, tech., c'ys., lb. | .07 - .08 | .07 - .08 | .07 - .08 |
| Sulphuric, 60%, tanks, ton. | 13.00 - . | 13.00 - . | 13.00 - . |
| Sulphuric, 66%, tanks, ton. | 16.50 - . | 16.50 - . | 16.50 - . |
| Tannic, tech., bbl., lb. | .71 - .73 | .71 - .73 | .71 - .73 |
| Tartaric, powd., bbl., lb. | .70 - . | .70 - . | .70 - . |
| Tungstic, bbl., lb. | nom - . | nom - . | nom - . |
| Alcohol, amyl. | - . | - . | - . |
| From Pentane, tanks, lb. | .131 - . | .131 - . | .131 - . |
| Alcohol, Butyl, tanks, lb. | .12 - .14 | .12 - .14 | .10 - . |
| Alcohol, Ethyl, 190 p.f., bbl., gal. | 8.19 - 8.25 | 8.19 - 8.25 | 8.19 - 8.25 |
| Denatured, 190 proof. | - . | - . | - . |
| No. 1 special, dr., gal. wks. | .60 - . | .60 - . | .60 - . |
| Alum, ammonia, lump, bbl., lb. | .03 - .04 | .03 - .04 | .03 - .04 |
| Potash, lump, bbl., lb. | .04 - .04 | .04 - .04 | .04 - .04 |
| Aluminum sulphate, com. bags, cwt. | 1.15 - 1.40 | 1.15 - 1.40 | 1.15 - 1.40 |
| Iron free, bg., cwt. | 1.85 - 2.10 | 1.85 - 2.10 | 1.85 - 2.10 |
| Aqua ammonia, 26%, drums, lb. | .02 - .03 | .02 - .03 | .02 - .03 |
| Aqua ammonia, tanks, lb. | .02 - .02 | .02 - .02 | .02 - .02 |
| Ammonia, anhydrous, cyl., lb. | .16 - . | .16 - . | .16 - . |
| Ammonium carbonate, powd. tech., casks, lb. | .09 - .12 | .09 - .12 | .09 - .12 |
| Sulphate, wks., ton. | 29.20 - . | 29.20 - . | 29.00 - . |
| Amylacetate tech., from pentane, tanks, lb. | .145 - . | .145 - . | .145 - . |
| Antimony Oxide, bbl., lb. | .15 - . | .15 - . | .15 - . |
| Arsenic, white, powd., bbl., lb. | .04 - .04 | .04 - .04 | .04 - .04 |
| Red, powd., kegs, lb. | nom - . | nom - . | nom - . |
| Barium carbonate, bbl., ton. | 60.00 - 65.00 | 60.00 - 65.00 | 60.00 - 65.00 |
| Chloride, bbl., ton. | 79.00 - 81.00 | 79.00 - 81.00 | 79.00 - 81.00 |
| Nitrate, casks, lb. | .11 - .12 | .11 - .12 | .11 - .12 |
| Blanch fix, dry, bbl., lb. | .03 - .04 | .03 - .04 | .03 - .04 |
| Bleaching powder, f.o.b., wks., drums, cwt. | 2.25 - 2.35 | 2.25 - 2.35 | 2.25 - 2.35 |
| Borax, gran., bags, ton. | 44.00 - . | 44.00 - . | 44.00 - . |
| Bromine, ca., lb. | .30 - .32 | .30 - .32 | .30 - .32 |
| Calcium acetate, bags. | 3.00 - . | 3.00 - . | 3.00 - . |
| Arsenate, dr., lb. | .07 - .08 | .07 - .08 | .06 - .07 |
| Carbide drums, lb. | .04 - .05 | .04 - .05 | .04 - .05 |
| Chloride, fused, dr., del. ton. | 18.00 - 24.00 | 18.00 - 24.00 | 18.00 - 24.00 |
| Flake, bags, del. ton. | 18.50 - 25.00 | 18.50 - 25.00 | 18.50 - 25.00 |
| Phosphate, bbl., lb. | .07 - .08 | .07 - .08 | .07 - .08 |
| Carbon bisulphide, drums, lb. | .73 - .80 | .73 - .80 | .73 - .80 |
| Tetrachloride drums, gal. | 2.00 - . | 2.00 - . | 2.00 - . |
| Chlorine, liquid, tanks, wks., 100 lb. cylinders. | .05 - .06 | .05 - .06 | .05 - .06 |
| Cobalt oxide, cans, lb. | 1.84 - 1.87 | 1.84 - 1.87 | 1.84 - 1.87 |
| Copperas, bgs., f.o.b., wks., ton. | 18.00 - 19.00 | 18.00 - 19.00 | 18.00 - 19.00 |
| Copper carbonate, bbl., lb. | .18 - .20 | .18 - .20 | .18 - .20 |
| Sulphate, bbl., cwt. | 5.15 - 5.40 | 5.15 - 5.40 | 5.15 - 5.40 |
| Cream of tartar, bbl., lb. | .57 - . | .57 - . | .57 - . |
| Diethylene glycol, dr., lb. | .14 - .15 | .14 - .15 | .14 - .15 |
| Epsom salt, dom., tech., bbl., cwt. | 1.90 - 2.00 | 1.90 - 2.00 | 1.90 - 2.00 |
| Ethyl acetate, drums, lb. | .12 - . | .12 - . | .12 - . |
| Formaldehyde, 40%, bbl., lb. | .05 - .06 | .05 - .06 | .05 - .06 |
| Furfural, tanks, lb. | .09 - . | .09 - . | .09 - . |
| Fusel oil, drums, lb. | .18 - .19 | .18 - .19 | .18 - .19 |
| Glaucous salt, bags, cwt. | 1.05 - 1.10 | 1.05 - 1.10 | 1.05 - 1.10 |
| Glycerine, c.p., drums, extra, lb. | .18 - . | .18 - . | .18 - . |
| Lead: | | | |
| White, basic carbonate, dry casks, lb. | .08 - . | .08 - . | .08 - . |
| White, basic sulphate, sk., lb. | .07 - . | .07 - . | .07 - . |
| Red, dry, sk., lb. | .09 - .09 | .09 - . | .09 - . |
| Lead acetate, white crys., bbl., lb. | .12 - .13 | .12 - .13 | .12 - .13 |
| Lead arsenate, powd., bag, lb. | .11 - .12 | .11 - .12 | .11 - .12 |
| Lime, chem., bulk, ton. | 8.50 - . | 8.50 - . | 8.50 - . |
| Litharge, powd., sk., lb. | .08 - . | .08 - . | .08 - . |
| Lithopone, bags, lb. | .04 - .04 | .04 - .04 | .04 - .04 |
| Magnesium carb., tech., bags, lb. | .06 - .06 | .06 - .06 | .06 - .06 |

The accompanying prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. works, quotations are given on that basis and are so designated. Prices are corrected to December 14

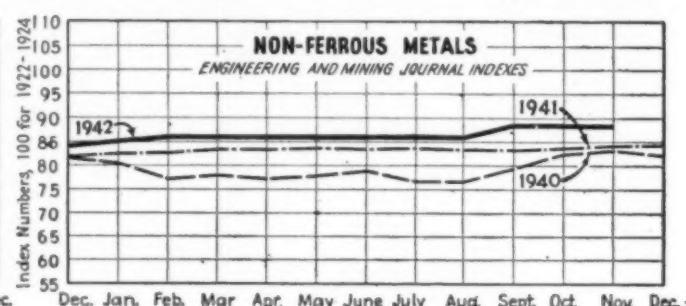
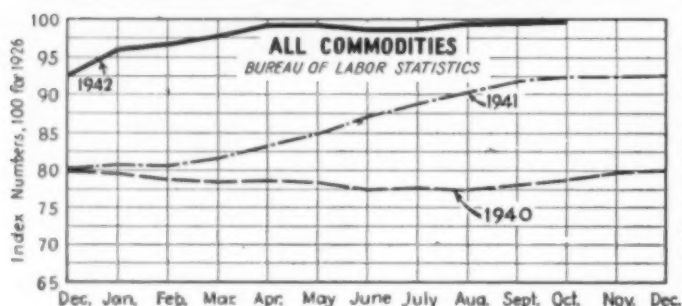
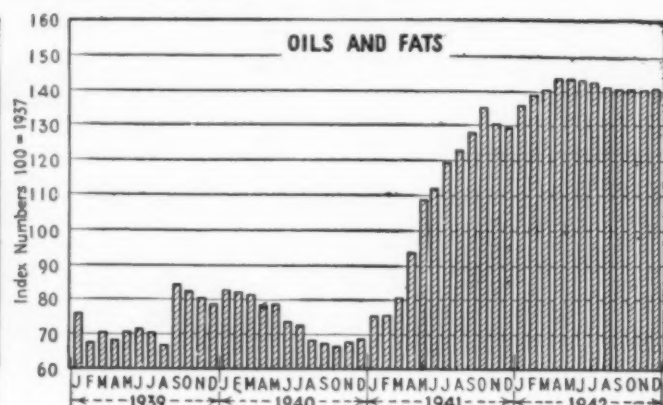
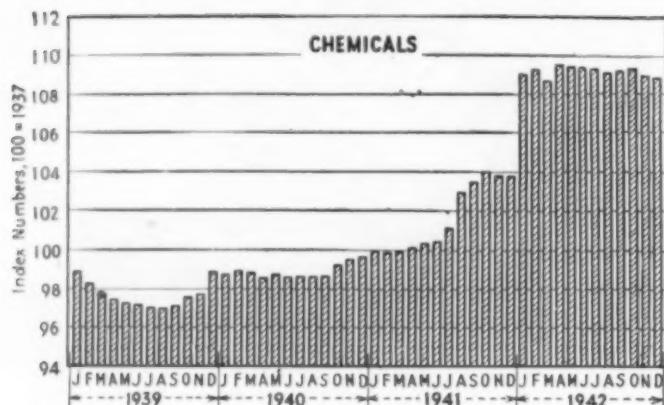
CHEM
& MET
CURRENT
PRICES

| | Current Price | Last Month | Last Year |
|--|---------------|---------------|---------------|
| Methanol, 95%, tanks, gal. | .60 - . | .60 - . | .60 - . |
| 97%, tanks, gal. | .60 - . | .60 - . | .60 - . |
| Synthetic, tanks, gal. | .28 - . | .28 - . | .28 - . |
| Nickel salt, double, bbl., lb. | .13 - .13 | .13 - .13 | .13 - .13 |
| Orange mineral, csk., lb. | .12 - . | .12 - . | .12 - . |
| Phosphorus, red, cases, lb. | .40 - .42 | .40 - .42 | .40 - .42 |
| Yellow, cases, lb. | .18 - .25 | .18 - .25 | .18 - .25 |
| Potassium bichromate, casks, lb. | .09 - .10 | .09 - .10 | .09 - .10 |
| Carbonate, 80-85%, calc. csk., lb. | .06 - .07 | .06 - .07 | .06 - .07 |
| Chlorate, powd., lb. | .10 - .12 | .10 - .12 | .10 - .12 |
| Hydroxide (caustic potash) dr., lb. | .07 - .07 | .07 - .07 | .07 - .07 |
| Muriate, 60% bags, unit. | .53 - . | .53 - . | .53 - . |
| Nitrate, bbl., lb. | .05 - .06 | .05 - .06 | .05 - .06 |
| Permanganate, drums, lb. | .19 - .20 | .19 - .20 | .19 - .20 |
| Prussiate, yellow, casks, lb. | .17 - .18 | .17 - .18 | .17 - .18 |
| Sal ammoniac, white, casks, lb. | .0515 - .06 | .0515 - .06 | .0515 - .06 |
| Salsoda, bbl., cwt. | 1.00 - 1.05 | 1.00 - 1.05 | 1.00 - 1.05 |
| Salt cake, bulk, ton. | 17.00 - . | 17.00 - . | 17.00 - . |
| Soda ash, light, 58%, bags, contract, cwt. | 1.05 - . | 1.05 - . | 1.05 - . |
| Dense, bags, cwt. | 1.10 - . | 1.10 - . | 1.10 - . |
| Soda, caustic, 76%, solid, drums, cwt. | 2.30 - 3.00 | 2.30 - 3.00 | 2.30 - 3.00 |
| Acetate, del., bbl., lb. | .05 - .08 | .05 - .06 | .05 - .06 |
| Bicarbonate, bbl., cwt. | 1.70 - 2.00 | 1.70 - 2.00 | 1.70 - 2.00 |
| Bichromate, casks, lb. | .07 - .08 | .07 - .08 | .07 - .08 |
| Bisulphate, bulk, ton. | 16.00 - 17.00 | 16.00 - 17.00 | 16.00 - 17.00 |
| Bisulphite, bbl., lb. | .03 - .04 | .03 - .04 | .03 - .04 |
| Chlorate, kegs, lb. | .06 - .06 | .06 - .06 | .06 - .06 |
| Cyanide, cases, dom., lb. | .14 - .15 | .14 - .15 | .14 - .15 |
| Fluoride, bbl., lb. | .08 - .09 | .08 - .09 | .08 - .09 |
| Hyposulphite, bbl., cwt. | 2.40 - 2.50 | 2.40 - 2.50 | 2.40 - 2.50 |
| Metasilicate, bbl., cwt. | 2.50 - 2.65 | 2.50 - 2.65 | 2.50 - 2.65 |
| Nitrate, bulk, cwt. | 1.35 - . | 1.35 - . | 1.35 - . |
| Nitrite, casks, lb. | .06 - .07 | .06 - .07 | .06 - .07 |
| Phosphate, tribasic, bags, lb. | 2.70 - . | 2.70 - . | 2.70 - . |
| Prussiate, yel. drums, lb. | .10 - .11 | .10 - .11 | .10 - .11 |
| Silicate (40% dr.), wks., cwt. | .80 - .85 | .80 - .85 | .80 - .85 |
| Sulphide, fused, 60-62%, dr. lb. | .03 - .03 | .03 - .03 | .03 - .03 |
| Sulphite, crys., bbl., lb. | .02 - .02 | .02 - .02 | .02 - .02 |
| Sulphur, crude at mine, bulk, ton. | 16.00 - . | 16.00 - . | 16.00 - . |
| Chloride, dr., lb. | .03 - .04 | .03 - .04 | .03 - .04 |
| Dioxide, cyl., lb. | .07 - .08 | .07 - .08 | .07 - .08 |
| Flour, bag, cwt. | 1.90 - 2.40 | 1.90 - 2.40 | 1.90 - 2.40 |
| Tin Oxide, bbl., lb. | .55 - . | .55 - . | .55 - . |
| Crystals, bbl., lb. | .39 - . | .39 - . | .39 - . |
| Zinc, chloride, gran., bbl., lb. | .05 - .06 | .05 - .06 | .05 - .06 |
| Carbonate, bbl., lb. | .14 - .15 | .14 - .15 | .14 - .15 |
| Cyanide, dr., lb. | .33 - .35 | .33 - .35 | .33 - .35 |
| Dust, bbl., lb. | .10 - . | .10 - . | .10 - . |
| Zinc oxide, lead free, bag, lb. | .07 - . | .07 - . | .07 - . |
| 5% leaded, bags, lb. | .07 - . | .07 - . | .07 - . |
| Sulphate, bbl., cwt. | 3.85 - 4.00 | 3.85 - 4.00 | 3.85 - 4.00 |

OILS AND FATS

| | Current Price | Last Month | Last Year |
|---|-----------------|-----------------|-----------------|
| Castor oil, No. 3 bbl., lb. | \$0.13 - \$0.14 | \$0.13 - \$0.14 | \$0.13 - \$0.13 |
| Chinawood oil, bbl., lb. | .38 - . | .38 - . | .35 - . |
| Cocunut oil, Ceylon, tank, N. Y., lb. | nom - . | nom - . | .07 - . |
| Corn oil crude, tanks (f.o.b. mill), lb. | .12 - . | .12 - . | .11 - . |
| Cottonseed oil, crude (f.o.b. mill), tanks, lb. | .12 - . | .12 - . | .11 - . |
| Linseed oil, raw car lots, bbl., lb. | .126 - . | .128 - . | .104 - . |
| Palm, casks, lb. | .09 - . | .09 - . | .09 - . |
| Peanut oil, crude, tanks (mill), lb. | .13 - . | .13 - . | .12 - . |
| Rapeseed oil, refined, bbl., lb. | nom - . | nom - . | nom - . |
| Soya bean, tank, lb. | .11 - . | .11 - . | .10 - . |
| Sulphur (olive foots), bbl., lb. | nom - . | nom - . | .17 - . |
| Cod, Newfoundland, bbl., gal. | nom - . | nom - . | nom - . |
| Menhaden, light pressed, bbl., lb. | .117 - . | .117 - . | .112 - . |
| Crude, tanks (f.o.b. factory) lb. | .088 - . | .088 - . | .08 - . |
| Grease, yellow, loose, lb. | .08 - . | .08 - . | .08 - . |
| Oleo stearine, lb. | .09 - . | .09 - . | .09 - . |
| Oleo oil, No. 1. | .11 - . | .11 - . | .11 - . |
| Red oil, distilled, d.p.p. bbl., lb. | .11 - . | .11 - . | .11 - . |
| Tallow extra, loose, lb. | .08 - . | .08 - . | .09 - . |

Chem. & Met.'s Weighted Price Indexes



Coal-Tar Products

| | Current Price | Last Month | Last Year |
|--|---------------|---------------|---------------|
| Alpha-naphthol, crude bbl., lb.... | \$0.52-\$0.55 | \$0.52-\$0.55 | \$0.52-\$0.55 |
| Alpha-naphthylamine, bbl., lb.... | .32-.34 | .32-.34 | .32-.34 |
| Aniline oil, drums, extra, lb.... | .15-.16 | .15-.16 | .15-.16 |
| Aniline, salts, bbl., lb.... | .22-.24 | .22-.24 | .22-.24 |
| Benzaldehyde, U.S.P., dr., lb.... | .85-.95 | .85-.95 | .85-.95 |
| Benzidine base, bbl., lb.... | .70-.75 | .70-.75 | .70-.75 |
| Benzoic acid, U.S.P., kgs., lb.... | .54-.56 | .54-.56 | .54-.56 |
| Benzoic chloride, tech., dr., lb.... | .23-.25 | .23-.25 | .23-.25 |
| Benzol, 90%, tanks, works, gal.... | .15-.16 | .15-.16 | .14-.15 |
| Beta-naphthol, tech., drums, lb.... | .23-.24 | .23-.24 | .23-.24 |
| Cresol, U.S.P., dr., lb.... | .11-.12 | .11-.12 | .10-.11 |
| Crotylic acid, dr., wks., gal.... | .81-.83 | .81-.83 | .81-.83 |
| Diethylaniline, dr., lb.... | .40-.45 | .40-.45 | .40-.45 |
| Dinitrophenol, bbl., lb.... | .23-.25 | .23-.25 | .23-.25 |
| Dinitrotoluol, bbl., lb.... | .18-.19 | .18-.19 | .18-.19 |
| Dip oil, 15%, dr., gal.... | .23-.25 | .23-.25 | .23-.25 |
| Diphenylamine, dr. f.o.b. wks., lb.... | .60-.62 | .60-.62 | .70-.72 |
| H-acid, bbl., lb.... | .45-.50 | .45-.50 | .45-.50 |
| Naphthalene, flake, bbl., lb.... | .07-.071 | .07-.071 | .07-.071 |
| Nitrobenzene, dr., lb.... | .08-.09 | .08-.09 | .08-.09 |
| Para-nitraniline, bbl., lb.... | .47-.49 | .47-.49 | .47-.49 |
| Phenol, U.S.P., drums, lb.... | .13-.14 | .13-.14 | .13-.14 |
| Picric acid, bbl., lb.... | .35-.40 | .35-.40 | .35-.40 |
| Pyridine, dr., gal.... | 1.70-1.80 | 1.70-1.80 | 1.70-1.80 |
| Resorcinol, tech., kegs., lb.... | .75-.80 | .75-.80 | .75-.80 |
| Salicylic acid, tech., bbl., lb.... | .33-.40 | .33-.40 | .33-.40 |
| Solvent naphtha, w.w., tanks, gal.... | .27-.28 | .27-.28 | .27-.28 |
| Tolidine, bbl., lb.... | .86-.88 | .86-.88 | .86-.88 |
| Toluol, drums, works, gal.... | .33-.34 | .33-.34 | .32-.33 |
| Xylol, com., tanks, gal.... | .26-.27 | .26-.27 | .26-.27 |

Miscellaneous

| | Current Price | Last Month | Last Year |
|--|-----------------|-----------------|-----------------|
| Barytes, grd., white, bbl., ton.... | \$22.00-\$25.00 | \$22.00-\$25.00 | \$22.00-\$25.00 |
| Casein, tech, bbl., lb.... | .19-.20 | .19-.20 | .291-.30 |
| China clay, dom., f.o.b. mine, ton.... | 8.00-20.00 | 8.00-20.00 | 8.00-20.00 |
| Dry colors | | | |
| Carbon gas, black (wks.), lb.... | .0335-.30 | .0335-.30 | .0335-.30 |
| Prussian blue, bbl., lb.... | .36-.37 | .36-.37 | .36-.37 |
| Ultramarine blue, bbl., lb.... | .11-.26 | .11-.26 | .11-.26 |
| Chrome green, bbl., lb.... | .214-.30 | .214-.30 | .214-.30 |
| Carmine, red, tins, lb.... | 4.60-4.75 | 4.60-4.75 | 4.60-4.75 |
| Para toner, lb.... | .75-.80 | .75-.80 | .75-.80 |
| Vermilion, English, bbl., lb.... | 3.05-3.10 | 3.05-3.10 | 3.20-3.25 |
| Chrome yellow, C.P., bbl., lb.... | .141-.151 | .141-.151 | .141-.151 |
| Feldspar, No. 1 (f.o.b.N.C.), ton.... | 6.50-7.50 | 6.50-7.50 | 6.50-7.50 |
| Graphite, Ceylon, lump, bbl., lb.... | .08-.10 | .08-.10 | .08-.10 |
| Gum copal Congo, bags, lb.... | .09-.30 | .09-.30 | .09-.30 |
| Manila, bags, lb.... | .09-.15 | .09-.15 | .09-.15 |
| Demar, Batavia, cases, lb.... | .10-.22 | .10-.22 | .10-.22 |
| Kauri, cases, lb.... | .18-.60 | .18-.60 | .18-.60 |
| Kieselguhr (f.o.b. mines), ton.... | 7.00-40.00 | 7.00-40.00 | 7.00-40.00 |
| Magnesite, calc, ton.... | 64.00-65.00 | 64.00-65.00 | 65.00-66.00 |
| Pumice stone, lump, bbl., lb.... | .05-.07 | .05-.08 | .05-.07 |
| Imported, casks, lb.... | nom | nom | nom |
| Rosin, H., 100 lb.... | 3.97-4.02 | 4.02-4.08 | 3.48-3.50 |
| Turpentine, gal.... | .691-.70 | .70-.71 | .791-.80 |
| Shellac, orange, fine, bags, lb.... | .39-.40 | .39-.40 | .38-.39 |
| Bleached, bonedry, bags, lb.... | .39-.40 | .39-.40 | .38-.39 |
| T. N. Bags, lb.... | .31-.32 | .31-.32 | .28-.29 |
| Soapstone (f.o.b. Vt.), bags, ton.... | 10.00-12.00 | 10.00-12.00 | 10.00-12.00 |
| Talc, 200 mesh (f.o.b. Vt.), ton.... | 8.00-8.50 | 8.00-8.50 | 8.00-8.50 |
| 200 mesh (f.o.b. Ga.), ton.... | 6.00-8.00 | 6.00-8.00 | 6.00-8.00 |

Industrial Notes

RUMFORD CHEMICAL WORKS, Rumford, R. I., has incorporated the New York territory into the New England district and Walter Pfluger is now district manager for all New England. His headquarters remain at 17 Battery Place, New York.

YOUNGSTOWN MILLER CO., Sandusky, Ohio, has transferred Reeves E. Strobel from New York to Sandusky where he will be in charge of sales. R. Elliott Sullivan has joined the Pacific Coast sales staff with headquarters at Carlsbad, Calif. S. C. Cutler formerly Florida representative is now in Washington, D. C.

COPPERWELD STEEL CO., Warren, Ohio, has appointed A. H. Philpot manager of its Washington district office.

THE B. F. GOODRICH CO., Akron, Ohio, has appointed A. J. Baker manager of factory personnel. He is succeeded as war drive administrator by Preston B. Bergin.

REPUBLIC FILTERS, INC., New York, has doubled the space of its executives and sales offices at 480 Lexington Ave. and has acquired a second manufacturing plant at Paterson, N. J.

MONSANTO CHEMICAL CO., St. Louis, has added Dr. Charles W. Ripple to the staff of its organic chemicals division. Dr. Ripple will handle technical sales work in the petroleum chemicals department.

THE BROWN FINTUBE CO., Elyria, Ohio, has appointed Robert C. Sessions chief engineer of the company.

FARREL-BIRMINGHAM CO., INC., Ansonia, Conn., has appointed Edward S. Coe, Jr., manager of its office at 79 Wall St., New York, to succeed E. H. Thomas recently deceased.

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, has placed Russel L. Whitney in

charge of sales of its transformer division in Sharon, Pa. A. C. Farmer, formerly assistant sales manager, has been named assistant to the vice-president and A. P. Bender, former sales manager who is recovering from a long illness has been made assistant sales manager.

AMERICAN ENGINEERING CO., Philadelphia, has retained Prof. E. L. Midgette as consultant. Professor Midgette will continue as professor of machine design at the Polytechnic Institute of Brooklyn.

FILTROL CORP., Los Angeles, has moved its general offices to 634 South Spring St.

AMERICAN HOME PRODUCTS CORP., Jersey City, has acquired the Harmon Color Works, East Paterson, as a wholly owned affiliate.

INTERNATIONAL MINERALS & CHEMICAL CO., Chicago, has added Donald N. Utesch to its sales staff.

CHEMICALS . . .

Available in Limited Quantities

. . . a bulletin about chemicals that can be supplied now in commercial amounts



CARBIDE and Carbon Chemicals Corporation produces more than 160 synthetic organic chemicals, and the supply situation among these products is constantly changing. Right now a number of them, including those described here, can be supplied in l.c.l. quantities. Some are available now because they are co-products in the making of other chemicals being used for high priority applications. Others are on hand because customers' plants have shifted to war production or cannot get other raw materials to go with them.

Before making a decision that depends on the supply of one of our products, check with us. Our technical service staff can give you up-to-the-minute information on delivery dates and quantities available. They can supply you with technical data on the chemicals we make, and can help you in the selection of replacements for unavailable materials.

At the time this magazine went to press these chemicals listed here . . . and a number of others . . . could be supplied in l.c.l. quantities. If you are interested in obtaining quantities of any of them, write or wire immediately since the supply situation may change at any time.

Diethyl "Cellosolve" is a stable ether that boils at 121.4°C. Since it dissolves both oils and water, it is a good mutual solvent, and it can be used with detergents and wetting agents of limited water solubility to prevent gelling or clouding in dilute solutions.

Ethylbutyl Acetate is a colorless liquid that boils at 162.4°C. Resembling amyl acetate in many of its properties and having the same toluene nitrocellulose dilution ratio (2.1), it is used as a moderately high boiling solvent in lacquers and synthetic resin finishes. Its evaporation rate is somewhat slower than that of amyl acetate; therefore, lacquers made with Ethylbutyl Acetate form smooth high-gloss films with little tendency to blush or orange peel. Ethylbutyl Acetate can also be used in nitrocellulose printing inks.

Isophorone is a high-boiling (215.2°C.) cyclic ketone with properties similar to those of cyclohexanone. It is the most powerful solvent known for polyvinyl chloride resins. Its carbonyl groups can be reacted with aldehydes, hydrocyanic acid, amines, and nitrogen derivatives, and it forms halogen, mercaptan, halogen acid, and alkyl amine addition products.

For information concerning the use of these chemicals address
CARBIDE AND CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation



30 East 42nd Street, New York, N. Y.



PRODUCERS OF SYNTHETIC ORGANIC CHEMICALS

CHEM & MET NEW CONSTRUCTION

PROPOSED WORK

Ark., Guion—Silica Products Co., Guion, plans to rebuild its dry kiln and loading chute. Estimated cost \$50,000.

Conn., Bridgeport—Aluminum Co. of America, 2190 Post Rd., Fairfield, plans to construct a factory. C. G. MacFarquhar, 2190 Post Rd., Fairfield, Engr.

Ind., Indianapolis—The Glidden Co., Beren and Madison Sts., Cleveland, O., has taken over the plant formerly occupied by the American Hominy Co. and will remodel same for its own use. The company also contemplates the construction of a soy bean oil processing plant when additional ground can be secured. Estimated cost \$250,000.

North Carolina—U. S. Government, Washington, D. C., has acquired the plant of the Darlington Fabrics Corp., Charlotte. Plant will be remodeled and operated by the National Carbon Co., Inc., New York, N. Y.

Ohio—U. S. Government, Washington, D. C., plans to construct a plant to be operated by Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Estimated cost will exceed \$3,000,000.

Ohio, Parral—Robinson Clay Products Co., Second National Bldg., Akron, O., plans to construct a continuous kiln at its plant in Tuscarawas Co. Estimated cost will exceed \$40,000.

Pennsylvania—U. S. Government, Washington, D. C., contemplates addition and interior and exterior alterations to plant here to be operated by Park & Tilford Distillers, Inc., 405 Fifth Ave., New York, and Brownsville, Pa.

Pa., Philadelphia—Snyder Paint Co., 2135 47 East Ontario St., plans the construction of a 3 story factory, office and warehouse building.

Texas—Col-Tex Refining Co., Colorado City, Tex., plans to drill, case and develop two 4000 ft. deep test oil wells. Estimated cost \$80,000.

Tex., Snyder—Fuller Cotton Oil Co., Snyder, plans to reconstruct its cotton oil mill. Estimated cost \$40,000.

Washington—U. S. Government, Washington, D. C., plans the construction of a plant to be operated by the Hooker Electro Chemical Co., Niagara Falls, N. Y. Estimated cost \$200,000.

B. C., Vancouver—Dextrose Syrup Co., Ltd., 210 Pacific Bldg., plans to construct a manufacturing and refining plant for dextrose syrup, glucose, starch, etc.

N. B., St. John—Canada Veneers, Ltd., Wall St., plans the construction of a 20x85x165 ft. plant. Estimated cost including equipment \$165,000.

Ont., Chatham—Syndicate c/o W. E. Reid, Chatham, plans to construct a soy bean refinery. Estimated cost \$50,000.

Ont., Niagara Falls—North American Cyanamid, Ltd., 7 Fourth St., plans to construct an addition to its plant. Estimated cost \$50,000.

Ont., Oakville—Barringham Rubber Co., Ltd., Reynolds St., N., Oakville, Ont., will soon receive bids for the construction of a recovery plant. Estimated cost \$152,884.

Ont., Ottawa—Canadian Phosphate Mining Co., W. E. Houghton, 1236 Wellington St., plans to construct a mining, crushing and washing plant. Estimated cost \$40,000.

Ont., Toronto—Gutta Percha & Rubber Co., Ltd., 28 West Lodge Ave., plans to construct an addition to its plant. Estimated cost \$40,000.

Que., Kilmar—Canadian Refractories, Ltd., Canada Cement Bldg., Montreal, is having revised plans prepared and will soon receive bids for the construction of a mill addition. R. C. Betts, 230 Lazard Ave., Montreal, Archt. Estimated cost \$75,000.

Que., St. Laurent—Industrial Glass Works Co., Ltd., 57 Ouimet St., plans to remodel its plant. Estimated cost \$40,000.

CONTRACTS AWARDED

Illinois—Texas Co., 332 South Michigan Ave., Chicago, Ill., has awarded the contract for additions to its plant to Foster-Wheeler Corp., 105 West Adams St., Chicago. Estimated cost \$2,000,000.

Kentucky—Rubber Reserve Corp., 811 Vermont Ave., N. W., Washington, D. C., has entered into a contract with the National Synthetic Rubber Corp. composed of Goodall Rubber, Inc., and Hamilton Rubber Manufacturing Co., both of Trenton, N. J.; Hewitt Rubber Corp., Buffalo, N. Y.; Lee Rubber & Tire Corp., Conshohocken, Pa. and Minnesota Mining & Manufacturing Co., St. Paul, Minn., to operate a new government-owned plant to be constructed here.

Maryland—U. S. Government, Washington, D. C., has awarded the contract for the construction of a plant to be operated by the Air Reduction Sales Co. to United Engineers & Constructors, 1401 Arch St., Philadelphia, Pa. Estimated cost \$45,000.

Michigan—U. S. Engineer, 700 Union Guardian Bldg., Detroit, has awarded the contract for the construction of a laboratory building in Wayne Co. to Gerhardt Construction Co., East Forest Ave., Detroit. Estimated cost less than \$1,000,000.

Mich., Detroit—Aluminum Co. of America, 3311 Dunn St., has awarded the contract for the construction of a factory to Stibbard Construction Co., 3000 Grand River Ave. Estimated cost \$150,000.

Minn., Minneapolis—Bemis Bros. Bag Co., 600-20 South Fourth St., manufacturer of paper bags, containers, etc., has awarded the contract for improvements to its plant to Northwestern Construction Co., 1401 Third Ave., S.

| Current Projects | | Cumulative 1942 | |
|--------------------------|--------------------|----------------------|----------------------|
| Proposed Work | Contracts | Proposed Work | Contracts |
| New England..... | \$40,000 | \$2,670,000 | \$4,555,000 |
| Middle Atlantic..... | 80,000 | 7,151,000 | 109,281,000 |
| South..... | 40,000 | 11,640,000 | 94,373,000 |
| Middle West..... | 3,290,000 | 105,935,000 | 192,595,000 |
| West of Mississippi..... | 170,000 | 188,777,000 | 403,726,000 |
| Far West..... | 200,000 | 21,080,000 | 148,862,000 |
| Canada..... | 653,000 | 26,583,000 | 2,842,000 |
| | \$4,473,000 | \$383,836,000 | \$956,234,000 |

N. J., Belleville—Wallace & Tiernan Co., Inc., Mill St., has awarded the contract for the construction of a 1 story brick laboratory to Mahony-Troust Corp., 567 Main St., Passaic.

O., Cleveland—Wellman Bronze & Aluminum Co., F. S. Wellman, Pres., 6017 Superior Ave., has awarded the contract for five additions to its factory to J. L. Hunting Co., Ninth and Chester Bldg., Cleveland. Estimated cost \$100,000.

Pa., Philadelphia—The Barrett Co., Margaret and Bermuda Sts., manufacturers of roofing products, coal tar specialties, etc., has awarded the contract for the construction of an addition to its plant to Lauter Construction Co., Otis Bldg., Philadelphia.

Texas—American Republics Petroleum Co., Petroleum Bldg., Houston, will construct 2 plants here. Work will be done by force account and subcontracts. Estimated cost \$2,300,000.

Texas—Nyxotex Chemical Co., Mellie Esperson Bldg., Houston, has awarded the contract for the construction of a plant to William A. Brunet, Shell Bldg., Houston, at \$86,500.

Texas—Reconstruction Finance Corp., 811 Vermont Ave., N. W., Wash., D. C., has awarded the contract for the construction of a plant to the Chemical Construction Corp., 30 Rockefeller Plaza, New York, N. Y. Estimated cost \$12,000,000.

Texas—U. S. Government, Washington, D. C., has awarded the contract for the construction of a plant to be operated by Air Reduction Sales Co. to Rust Engineering Co., 2405 Collingsworth St., Houston. Estimated cost \$300,000.

Texas—U. S. Government, Washington, D. C., has awarded the contract for the construction of a plant to be operated by the Dow Chemical Co., Midland, Mich., to Stone & Webster, Commerce Bldg., Houston. Estimated cost \$2,500,000.

Utah—U. S. Government, Washington, D. C., has awarded the contract for the construction of a refinery to be leased to Utah Oil Refining Co., to M. W. Kellogg Co., 225 Bway., New York, N. Y. Estimated cost \$12,000,000.

Wis., Cornell—The Cornell Wood Products Co., manufacturers of wall board, folding box board and other paper board products, has awarded the contract for alterations and improvements to its 1 story mill to Hoepfner-Bartlett Co., 631 East Madison St., Eau Claire.

Wis., Green Bay—The Northern Paper Mills, Day St., manufacturer of tissue and other paper, is building a new addition to its mill. Work is being done by day labor.

Que., Fassett—Standard Chemical Co., Ltd., 5070 St. Ambroise St., Montreal, has awarded the contract for an addition to its plant to H. L. Gomoll, 243 Jane St., North Bay, Ont.

The Story That Must Be Told



Two men who know the story best: Donald Nelson, Chief of the U. S. War Production Board, and (right) Oliver Lyttelton, Great Britain's Minister of Production.

BETWEEN THE LINES of today's war news is written a story that is even more vital than the news itself. For through that story we begin to discern the pattern of victory, not yet complete in all its details but increasingly clear in its essentials.

It is the amazing story of how American industry has responded to the call for the weapons of total war, of how its technicians, workers, and managers are driving through an unprecedented task of fantastic size and complexity.

France fell in June 1940. During that month this country produced about \$150,000,000 in war goods. By June 1941 the Nazis had overrun the Balkans; and in that month our war production was \$800,000,000. The fateful month of December 1941 gave us an output of \$1,800,000,000—an increase better than tenfold in eighteen months. And in May 1942 our total expen-

ditures for war equipment and supplies mounted to the staggering total of \$3,500,000,000.

This is an increase of twentyfold within two years, of itself a stupendous industrial achievement. But what is even more important, that achievement already is making itself felt the world over—in the Orient, in Australia, in Libya, in Europe, in the Coral Sea, at Midway Island, at the Aleutians, and wherever else we find a battlefield manned by free men.

To accomplish it, many industries have been pouring out war materials at a rate that only six months ago did not seem even remotely possible. Starting from scratch, our factories have turned from their peacetime jobs, first to meet and then to surpass the most hopeful estimates of what might be expected of them.

To do this they have drawn heavily upon all of their resources. Their skilled and unskilled

man-power has thrown into the task a war-born will to work; their research staffs have bent to it all of their scientific resources; their engineers have applied to it their utmost ingenuity; their executives have devoted to it the full measure of that managerial skill which has won for American industry the respect of the modern world.

For the first time in history we have pushed the accelerator of the world's greatest engine of mass production down to the floorboard. Always in times of peace, factory men have had to gear production to what the markets would take. But now the market they are called upon to serve is hungry for the last ounce of potential output. For war confronts industry with a demand limited only by its capacity to produce.

During these feverish months, while a desperate world has watched breathlessly to see how American industry would perform as the arsenal of democracy, we of McGraw-Hill have followed with mounting pride—at times almost with wonder—a new miracle of industrial achievement.

Some day the full story of this American industrial effort will fill a brilliant chapter in the epic history of our times. Meanwhile it would be premature to celebrate the completion of this task. For victory has not yet been won; that still lies at the far end of a road that we may find to be long and arduous.

But even now we can be certain of one essential of that victory. American industry is doing its job; it is delivering all that the people have asked of it—and more.

As I have watched with my associates the unfolding of this picture, I have wished that it were possible to broadcast it, in full color and wealth of detail, to the people of America, so that they could understand at least, in part, the job their industry is doing for them. It would help, it seemed to me, if the men of industry themselves, each so intent on his own task, knew what their fellow-workers in other fields have been doing.

However, the managers of industry have been far too busy *doing* to talk. They are going to be just as busy for some time to come. Naturally, many details are yet to be spread upon the record and, indeed, the full story cannot be told. But that part of the story that can be told is well worth the telling and the hearing, if only for its revelation of the spirit of an awakened

America, throwing its all into the fight against the tyranny that has brought so many of the world's little people under its heel.

The 1941 war production of the United Nations, exclusive of the United States, equalled the total 1941 war output of Germany with all of its captive plants and enslaved labor. Since Germany's 1941 operations were at maximum capacity no further increase is possible. British output has been expanding to the point where its 1942 production is considerably ahead of Germany's.

In May 1942 American war production passed the British output 50 days ahead of schedule. In 1943 it will be 3 times that of the British.

This has been brought about under the leadership of Donald Nelson and the War Production Board, the Army, the Navy, the Maritime Commission, with the cooperation of management and labor. It has been furthered by the cooperation of Oliver Lyttelton, British Minister of Production, and other British production authorities.

But the story goes far beyond that. It gives us a glimpse of the America as it will emerge from this war, its industries again setting world standards of production, which will become the spearhead of our post-war economy.

This is a story that cannot be adequately told in generalities. It must be told in some detail. For instance, the great accomplishments of the machine tool industry, the great forward strides made by the aviation industry, the tremendous achievements of the chemical industry, the amazing conversion of many industries will warm the hearts of Americans.

These aspects of the subject deserve the fullest treatment and will be told month by month in these pages until the story has been completely unfolded. We will try to give a concise overall picture of the war job that industry has done and still is doing. You will find it a thoroughly American story of high American achievement in which every American can take pride and from which every American can take hope for the future of his country.

The story is far too significant to be withheld any longer.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

Machine Tool Builders . . .

the men behind our war production achievement

IT TOOK GERMANY six years to get ready for this war, and Japan even longer. But in less than twenty-four months American industry, starting from scratch, has caught up with and surpassed the war production of the Axis.

When France fell in June, 1940, we unfortunately had no gigantic munitions makers, like the Krupp or Skoda works, to turn to. We had been devoting our attention to making refrigerators and vacuum cleaners and motor cars and lawn mowers. Ordnance output for our Army was a mere million dollars a month. A sad commentary on our National state of mind and our lack of responsible political leadership.

Yet during June of this year, our industries, transformed from peacetime pursuits, produced close to a thousand times that amount. A thousand-fold increase in two years!

The same spectacular gains hold throughout our war program — for ships, planes, guns, tanks, a thousand items. We are well on our way toward the 60,000 planes, 20,000 anti-aircraft guns, 45,000 tanks and 8,000,000 tons of shipping that the President asked us to produce in 1942, and toward the much larger production projected for the year 1943.

We are well on our way thanks to a number of factors, one of the most vital being the extraordinary job done by the machine tool industry. For it has equipped America's metal-working shops with the tools they need to turn out the vast quantities of war weapons.

The machine tool industry's importance springs from the fact that almost every metal product, from mechanical pencils to giant guns, is made with machine tools. They transform pieces of steel into parts for automobiles, farm implements and radios—and for airplanes, guns and tanks.

The Garand rifle, highly praised by General MacArthur at Bataan, has 72 metal parts requir-

ing 1040 separate cutting operations on machine tools. A 40-millimeter gun mount is made up of 1500 separate parts, built to the tolerance of a Swiss watch. Each part must be machined, not once, but several times.

No wonder that when the American defense program was undertaken two summers ago, the American machine tool industry was the first to be called into service. Ninety-five thousand machines were wanted as quickly as possible from 250 builders who in peacetime had produced some 25,000 machines a year.

But the demand did not stop there. The Army, the Navy and the Air Force kept asking for more as the war production program was expanded again and again. Nor was that all. The entire anti-Axis world besieged Washington with urgent requests—from London to Moscow, from Ottawa to Chungking.

To a man the machine tool builders responded. New factories and additions to old plants were built, with deliberate disregard of the prospect that all these sharply expanded facilities could not be used after the war.

To increase output from existing plants practically every company went to two long shifts or three short ones. The industry's work-week was greatly extended. From the beginning of our effort, it has been the longest of any industry.

Working forces were enlarged from 40,000 to 110,000, and this latter figure does not include tens of thousands of employees with sub-contracting firms. Though machine tool building requires a higher degree of individual skill than most products, "learner" courses have been set up to train men quickly. Over 15,000 men and women now are in training.

The machine tool builders were among the first to go in for sub-contracting. They have farmed out parts, subassemblies and complete

machines right and left. To meet their needs, for example, repair shops of carpet mills are making milling machines, a laundry machinery company is producing radial drills, and an automobile body builder is making planers and boring mills.

Machine tool manufacturers quickly shelved peacetime practices to concentrate manufacture on the sizes and types of machines critically needed for the war program. They adopted mass production methods wherever possible, although machine tools are essentially a tailor-made product. They sent their sales engineers, as did machine tool dealers also, to hundreds of munitions makers with invaluable advice as to tooling up most efficiently for their particular jobs.

The swift action taken by the machine tool builders shows what private enterprise can do to meet a national emergency. They were the first to institute a voluntary system of priorities.

All of this involved an almost explosive expansion of the industry. Machine tool builders produced an average of only 7,500 machines a year from 1931 to 1934. In an ordinary year, output totals 25,000 machines. But in 1940, it rose to 112,500, and in 1941 to 187,500.

The 95,000 machine tools wanted for the original defense program were built and delivered within eight months.

Today more than 1,000 machine tools are being shipped to war factories every twenty-four hours, and for seven days a week. Each month's output exceeds that of an entire normal peacetime year and is five times that of the depression year of 1932. And each succeeding month is shattering all previous records.

It is this amazing performance that led Under Secretary of War Robert P. Patterson to declare that "machine tools are the foundation on which our production structure is built. American machine tool men are doing a stupendous job. Machine tools are now being turned out at a rate of \$1,380,000,000 a year. Machine tool designers have worked to improve tools so much that machine tool effectiveness today is one-third to one-half greater than it was in 1930. Our production today is 16 times what it was—in capacity to cut metal—at the peak of the World War."

The results of this performance by this key industry, so satisfying to the Nation, do not spring wholly from the numbers of machine tools produced. They stem also from their improved quality and greater productivity.

Today's warfare differs radically from that of 1917-1918. It calls for mechanized weapons so complicated in design and built to such a fine degree of accuracy that they are beyond comparison with the weapons of a generation ago.

Machine tools, completely redesigned during the depression years, are meeting these new and exacting requirements. In addition, thousands of machine tools of special design, without counterpart in peacetime work, have been built.

The record of the war industries most directly dependent on the machine tool industry speaks for itself. One tank manufacturer alone is producing more than thirty big tanks a day. A midwestern plant is completing 35 anti-aircraft guns a day, round the clock without interruption. A tank engine factory, tooled up to make 650 units a month, is actually building over 1500 a month. Demolition bombs, destined for Berlin and Tokyo, are being made by the tens of thousands every month. Machine guns are being produced at a rate of 50,000 a month.

These manufacturers, all machine tool users, are far in advance of the timetables set for them.

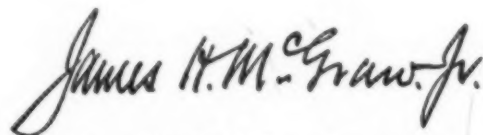
All this is good news for the American people and bad news for the Axis. It is proof that American industry, with each individual and specialized industry doing its part, is living up to the faith put in it by the American people.

But it is more than that, too. It is a guarantee of our confidence in the peacetime future of American industry and of the free enterprise system under which this miracle has been wrought.

Perhaps more than anything else, the foundation of that confidence must be faith in the far-sightedness, the ingenuity, the engineering and designing skill, and the managerial know-how of the machine tool makers.

On them we depend for the most essential tools of the post-war production economy. Without them, our vision of better living standards and full employment through more efficient production and distribution can never be more than a vision.

What they have done as the toolmakers for war is proof of what they can do as the toolmakers of peace. How they have done it as free men is a demonstration of what free men will do.



President, McGraw-Hill Publishing Company, Inc.

The Aviation Industry is doing its job...

A Year's Production A Week — Every Week

A MERE hundred planes a month in 1938; 200 in 1939; 450 in 1940; 1,600 in 1941, and today, as this is written, plane production goes on at a rate of 5,000 a month. A previous year's production now in one single week — every week.

So begins the story of the greatest industrial expansion in history; an industrial miracle that far surpasses anything our enemies ever have done or can do. Not only did we out-produce the Axis but the acceleration in our production during the past 12 months exceeded the greatest increase in German output during their forced-draft war preparation of 1939, when their production rose from 1,100 to 1,600 planes per month.

The toughest part of our job was accomplished in 20 months. We boosted deliveries from 100 or so to 1,000 planes a week, passing the combined Axis powers. Today, Germany's curve is flattening; ours is climbing steeply. Lt. Gen. Henry H. Arnold, Chief of the Army Air Forces, assures us that Army contractors will produce not less than 148,000 planes in the remainder of 1942 and in 1943. During that same period Navy contractors will turn out at least 37,000 additional planes.

Manpower in the airframe, engine and propeller industries was increased from 125,000 to 450,000 workers during the past 20 months, with the prospect that the industry will be employing more than 1,000,000 men and women in 1943. Many manufacturers are solving their personnel problems by recruiting women workers. More than 40,000 of them — teachers, stenographers, waitresses, housewives and school girls — today are welders, assemblers, machine operators and inspectors on aircraft production lines. Productive floor space in the airframe, engine and propeller industries expanded from 18,000,000 sq. ft. to nearly 55,000,000 sq. ft. during the last 20 months. Further expansion to more than 60,000,000 sq. ft. may be expected this year and an ultimate figure of more than 100,000,000 is a distinct possibility.

To grasp the full magnitude of this task we must remember that a single medium bomber has 30,000 parts, which are built into 650 minor sub-assemblies to make 32 major sub-assemblies. The entire process involves 30,000 man hours of labor. Each of the two engines in this plane requires 50,000 specialized inspections. Every one of the 50 instruments entails many hours of pre-

cision workmanship. Yet today there is one factory turning out 4 bombers every day. Another produces fighters at the rate of nearly 20 a day.

To the amazement of the entire world these manufacturing miracles were accomplished without sacrificing the high standard of American aeronautical equipment. There has been some loose talk about the quality of our combat airplanes as compared with those of our allies and our enemies. Indisputable evidence of the superior stamina of our aircraft under fire is written between the lines of almost every war communique. Every battle record tells a story of heavy losses inflicted at small cost upon numerically superior enemy forces. The consistency of this performance on all the far-flung battlefronts constitutes the most eloquent testimony of the high calibre of our designs, our manufacturing methods and the skill and daring of our pilots.

And let us remember that our decisive victory in the battle of production was not won without headaches and heartaches on the part of management, labor and government.

When the President sounded the call for 50,000 planes in the spring of 1940, the program called for only 5,500 military aircraft. Government and industry reeled from the shock — both determined, however, that it *could and would be done*.

The Army, the Navy and the old Defense Advisory Commission set to work to draft a program. This has been revised many times — upward! Congress then proceeded, more slowly, to modify the laws that would have obstructed the realization of the objective. Then the aviation industry, without contracts, in the face of discriminatory profit-limitative legislation, and with nothing but oral assurances of governmental intentions, went ahead with its Herculean expansion plans. New factories were completed long before facilities-contracts and their funds were forthcoming.

The rugged individualists who had founded and built the aviation industry cast aside their rivalries and embarked upon a period of unselfish cooperation. Priceless engineering experience was exchanged. Material was relinquished for transfer to plants where it was needed more urgently. Successful personnel training methods and experience in the use of women workers were pooled for the benefit of all concerned. During one re-

cent month, the cooperation among eight southern California plants averted more than 1,860 potential bottlenecks in production.

As the lessons of the war dictated the need for greater numbers of particular airplane types, many manufacturers accepted orders for planes designed and developed at rival factories. Striking examples are the long range bombers being turned out by plants where only trainers, fighters or dive bombers formerly were made.

Mindful of the risk involved in educating rivals, thereby creating future potential competition, subcontractors nevertheless were sought and trained by pioneer manufacturers. Makers of toys and wheelbarrows, automatic stokers and linoleum were among those who rallied to the call. Within a year subcontracting rose from 13 to 36 per cent of the total program. It still is rising.

When the automotive industry came into the picture, aviation manufacturers gave generously of their time and knowledge to start the newcomers. Liberal licensing arrangements enabled them to reap the full benefits of technical developments. Automotive engineers swarmed through the aviation plants in search of the exacting "know-how" of the aeronautical industry.

Each type of aircraft that reaches the production stage is the result of long periods of research, design and development. The unseen workers toiling in the wind tunnels and the laboratories of government and industry are the unsung heroes who tirelessly are striving to surpass all previous efforts. Their brilliant accomplishments are eloquent testimony of the superiority of men and women who are blessed with freedom of action and thought. Today more than 20 experimental combat airplanes are under development and will replace older types as soon as they fulfill the exacting requirements of our armed forces. Among these are aircraft that promise to outfight and to out-perform any and all of the much vaunted warplanes of the Axis military machine. And this without loss of production.

Every man, woman and child of all the United Nations may fervently be thankful that those who chart our course in aircraft production have not frozen design to such a degree as to make impossible the immediate adoption of improvements as they come out of these laboratories.

What does this brilliant record mean in terms of final victory?

Every newspaper reader has learned this basic war lesson . . . air supremacy is the essential ingredient of military success. As the balance of air power shifts, so do the fortunes of war.

In those dark days when our output was 500 planes a month, Germany's was 2,000 and the German air force

was twice that of our Allies. When we reached 2,000 a month last fall, Germany had advanced to a monthly rate of 2,500. Today, as this is written, we have caught up with the enemy's backlog. The air forces of both sides are about equal numerically and United Nations' production exceeds that of the Axis by 27 per cent. Next summer (1943) both the air force and the output of the United Nations will be double those of all the Axis powers.

That is the pattern of ultimate victory!

The pattern of the peace to follow also is gaining in definition. The airplane has shriveled the world to one-fifth its former size. Its use as an instrument of destruction is but a momentary distortion of the pattern of human progress. Its potential power, as a stern preserver of peace, is beyond imagination. Today's air routes of our Army Air Force Ferrying Command are the international trade routes of tomorrow. Giant airliners, by reducing time and space, will speed fraternity among the nations and disunity will give way to better understanding and goodwill.

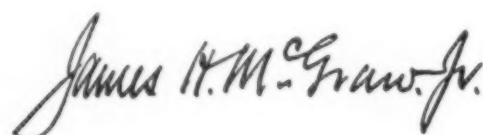
Flying freight trains, with aerial locomotives towing glider boxcars, will serve large cities, decentralizing population and giving to inland cities many of the commercial advantages of seaports. Air mail and passenger pick-up lines will fill the gaps between these trancontinental trunk lines and tie in the smallest hamlets. Universal fly-it-yourself services will provide airplane facilities for those who do not own low cost private aircraft. Roadable rotary wing aircraft and family planes of the fixed wing type may even run household errands.

The coming generation of business men who today is piloting our war planes will find aircraft as essential to business as it now finds them essential to victory.

Commenting on our war production record, Donald Nelson has said, "We are today in the position of men who realize that they are actually doing the impossible".

The mass production miracle that the aviation industry — management and workers alike — has performed through the all-out effort of free enterprise can and will serve civilization in peace as it has in war.

With this boundless new medium of transportation and its concurrent technological developments we shall rebuild our way of life to a rich, new fullness upon the ruins of a war-torn world.



President, McGraw-Hill Publishing Company, Inc.

The Chemical Engineer cuts years to months...

Born in the turmoil of the last war, he is shaping a new world with mighty swords and magic plowshares

GERMAN CONSUL-GENERAL HOSSENFELDER, writing from New York on March 3rd, 1916, to von Bethmann-Hollweg, chancellor of the Imperial German Government, confidently predicted defeat for the United States because we were totally dependent upon the great chemical industry of Germany. "Americans," he wrote, "can never establish such an industry. They have the resources but they lack the necessary science and technology. And, besides, the conflicting selfishness of American business renders it impossible."

Even before the ink was dry on Hossenfelder's letter a new figure appeared on the industrial scene—the American chemical engineer. With the help of patient, but progressive and venturesome capital, he laid the foundations for the largest and most resourceful chemical industry in the world.

Today he is an all-important figure. For we are fighting a chemical war, even though the emphasis that is placed on planes, tanks, ships, guns and other armament tends to obscure that fact. And this chemical engineer is waging war for us on a prodigious scale. Bombers carry more tons of more deadly explosives because he has developed stronger and lighter alloys and more efficient fuels. Tanks are better armored and wield heavier blows because of products and processes born in chemical laboratories. Ships are welded together by new metallurgical techniques that save precious months over older processes. Gun barrels that are made in minutes instead of hours shoot farther and faster because of better ammunition.

And quantity keeps pace with quality. By mid-year of 1942, explosives were being produced in newly constructed plants twelve times faster than a year ago. Smokeless powder output has been doubled since December. Five times as much TNT was being made in July as in the months preceding Pearl Harbor. One single new plant produces more of this high explosive than did the entire pre-war industry—and several of these plants already are in production.

By what Major General William N. Porter, Chief of the Chemical Warfare Service, calls a "miracle of production," the sort of incendiary bombs that General Doolittle's lads showered on Tokyo were rolling out of

our plants within a few weeks after we got into the war. As General Porter puts it, "they were rolling not by hundreds or even thousands, but by the millions." That record he has cited as a tribute to the "ingenuity, industriousness and patriotism" of the American chemical industries.

Yet the General agrees that we have only started to produce in the tremendous volumes that will shortly make Germany, Italy and Japan "revolve on their boasted Axis." Our newest plants are just coming into production. They face no limiting shortages of materials for, in the main, our chemical industry draws its strength from coal, salt, sulphur, limestone, oil, natural gas, coal-tar, air and water—all available in abundance.

We have heard little about the use of poison gas by our enemies. It may be that good reasons for this are stored away in our well-stocked chemical arsenals. American chemical manufacturers have worked hard and long with our armed forces so that if the time ever comes to make good on the President's warning of retaliation, America will be more than ready.

And defense against gas has not been overlooked. Every soldier is equipped with a most efficient type of gas mask, developed through twenty-five years of intensive research. The Chemical Warfare Service already is manufacturing millions of masks for distribution to civilians. Let us hope we may never have to use them. But if we must, we need have little fear of any gas or secret chemical.

This gas mask program has been made possible by a literal metamorphosis of production facilities, as peacetime industries have been converted to war purposes. A lumber company, for example, is making activated carbon from sawdust. Novelty manufacturers of rubber goods are turning out valves and assembling other parts. Former manufacturers of shirts, swim-suits, shoes and beds have converted their facilities and are contributing their share. More than eleven hundred contractors and two hundred and fifty sub-contractors are supplying their full quotas of chemical warfare materials. And production is right up to schedule.

But the bulk of the war job of our chemical industries has to do with items other than weapons and

ammunition. The German Consul-General, in that 1916 report to Berlin, said that many American industries were in a critical condition because of the scarcity of German chemicals. He related in particular that "the cries for help from the world of physicians are becoming louder and louder and more and more insistent." Thanks to our chemical industries this cry no longer is heard. Even though we are again cut off from quinine, camphor and some other strategic medicinals, our homes and hospitals are adequately supplied with synthetic products. Most of these are better and cheaper than the natural materials. The same sulfa drugs that have saved so many civilian lives in recent years have gone to war, with the result that deaths from infection at Pearl Harbor and Bataan are reported as surprisingly low. In this war we suffer no shortages of iodine and potash. Pioneering research in the field of vitamins has led to new industries that are contributing to health and better nutrition.

Those new uniforms the soldiers are wearing are of better quality and will last longer than the shoddy, ill-fitting outfits of 1918—thanks to sunfast dyes and new man-made products. And in the field of fabrics, nylon and the new rayons have gone to war in parachutes and super-strong cords for tank treads and tires.

* * * * *

And that brings up the question that 30,000,000 American motorists are asking with ever increasing concern. "When, Mr. Chemical Engineer, are you going to give us a set of new tires for the old family bus?"

That, I am told, is just what the chemical engineers have set about to do on a scale that is difficult to comprehend. In the words of Raymond Clapper, the columnist, "the synthetic rubber program for this year and the next is the biggest job of chemical engineering ever undertaken in the world." A billion dollar industry is being built at record speed to make almost a million tons a year of chemical rubber to serve our war needs and those of our allies. This cannot be accomplished overnight. Many months are required to design and fabricate complex equipment, much of which must be made from corrosion-resisting metals and alloys. We shall be lucky if a tenth of the desired capacity is in continuous production this year and even more lucky if, by the end of next year, the new industry should be turning out synthetic rubber at a rate of 875,000 tons—using both petroleum and grain as raw materials.

All this, of course, must go for essential military uses but there is reason to believe that in the laboratory and pilot-plant stages we have some promising substitutes and stop-gap materials that may tide us over until the big program starts rolling.

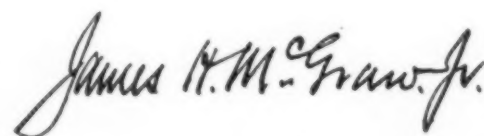
The present prospect of real success is possible only because of the cooperation of the chemical, rubber and petroleum industries. Individual firms and entire industries have set aside their normal desires and selfish interests to pool their patents, share their research and engineering developments for the common good. Synthetic rubber is here to stay as the basis for a great post-war industry: no doubt as to that lingers in the minds of the men who have seen many other natural products—indigo, alizarine, camphor, vanillin—all eventually fall before the ingenuity of the chemical industry.

* * * * *

In the coming peace to which we look forward hopefully, we shall find a new world full of new materials, new conveniences, new jobs, new opportunities, all stemming out of the present-day work of the chemical engineer. The same tough, transparent plastics that now make noses for bombers will give us new frameless windows for our homes and automobiles. With capacity to produce at least 2½ billion pounds of aluminum, which is five or six times pre-war production, and a magnesium capacity 50 or 60 times the pre-war figure, many new uses will develop for these structural materials of great strength and amazing lightness. Almost anything that flies, runs, moves, or otherwise is motive, will have a place for them. New fibers such as nylon and vinyon had scarcely got started before they were put to war use. Once the war is over they will be with us in greater abundance and at lower cost for a variety of uses so vast and so diverse that we can scarcely imagine them.

And the chemical engineer continues to create and to invent. He meets the challenge of scarcities and shortages with ever new "substitutes" that excel their originals. Even before the war is over he will have placed at our command a hundred new materials which we did not have before. His workshop is all industry. His contributions are as limitless as are our needs.

But right now his all-important job is to help win the war; to fight to a finish the ruthless and resourceful enemies that are devoting all their science and technology to bring about our defeat. So, as we take stock of our assets in this desperate struggle, we count among the first the proved resourcefulness of the research-minded chemical engineers we now have mobilized to help us fight this chemical war.



President, McGraw-Hill Publishing Company, Inc.

Construction—Builder of Bases

America's Great Peacetime Industry Goes to War

PUNCHED through 1,600 miles of trackless wilderness and rivaling the Panama Canal in strategic importance, the Alaska Highway will cut days and dangers from present supply routes . . . to Alaska . . . to the Aleutians . . . yes, to Japan itself!

This job, to be finished soon and well ahead of schedule, is but one example in thousands illustrating how construction sets the stage for our war effort . . . and why the construction engineer is vital to victory.

Back of America's busy production lines, expanding shipyards, growing cantonments and far-flung military bases is a series of swiftly executed construction jobs. Important jobs! *For the construction industry is a builder of bases. Bases for production—for training—for defense—and for attack.*

To conceive and to carry through so tremendous a program in a race against time is typically American. It requires enterprise and the sort of versatility that has been acquired by undertaking every kind of job; from a Boulder dam to a drydock, from a Pennsylvania Turnpike to a housing project, from a Radio City to a railroad tunnel . . . and taking it in stride. War's demands in the eyes of America's construction men, are simply more of the same—for a grimmer purpose, and under heavier pressure.

The civil engineers who develop the necessary designs, the contractors who execute them and the manufacturers who provide the equipment and materials, are as much a part of this war as are the men who face the enemy. The results of their labors are recorded in mounting production figures, and will be indelibly written in the military annals of this war. Those 60,000 airplanes, 45,000 tanks and 8,000,000 tons of shipping that the President asked for in 1942 will be supplied because—and only because—the construction industry did a Herculean plant-building job first—and fast.

Yes, construction, America's great peacetime industry, has gone all out for war. From a normal 6½ billion dollars in 1938, it got into its war stride last year with a 11½ billion dollar volume. And under the impetus of Pearl Harbor, the 1942 figure now promises to reach the unprecedented total of 15 billion dollars. "If buildings would win the war, Hitler would be licked now", said Lieut. Gen. William S. Knudsen recently. Which emphasizes the further fact that the construction industry was the *first* to go to war.

The technical and managerial talent that is accomplishing this mammoth job has had to find its strength and resources within itself. No possibility of "conversion" here! Only years of varied construction experience enabled it to tackle and to achieve the manifold tasks that building for war demands.

Take that cornfield, for instance, that Henry Ford picked for his record-breaking bomber plant. The spring mud was soft and deep when contractors moved in last year. They were entering a race against an almost impossible time limit. Before they could even begin on the plant itself, they had to build roads, lay a 4-mile water supply line and install a complete sewerage system with its disposal plant. But such varied jobs—each big in its own right—merely were antecedent to running up the framework and enclosure for the 60-acre factory itself. Or to

using road-building methods to pave a floor that was the equivalent of 25 miles of 20-foot wide concrete highway.

It was a race against the approaching winter, and to win it they had to push their \$1,000,000 worth of construction equipment to the limit—day and night. But win they did! It is accomplishments like these that explain how the nation's aviation factory floor space jumped from 18,000,000 to 60,000,000 square feet in

This is the fifth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

the past two years . . . why Fortresses and fighter ships are beginning to turn the scales of war in our favor.

"Somewhere in the Southwest" the Army called for a training base. The contractor who answered that call summed up his performance in characteristic fashion: "Beginning without so much as a contour map we had a \$10,000,000 project ready for operation within 90 calendar days, and saved 3½ million dollars of the estimated cost".

At another Army camp a contractor assembled a crew of 20,000 men who put together 1,400 buildings in 125 working days, along with a sewer system, a water-supply and a street layout of which many a fair-sized city might be proud. This job swallowed up 2,000 carloads of lumber, and 26,000 kegs of nails. So perfect was the teamwork, from the general manager down through the hundreds of superintendents and foremen to the specialized crews, that as many as seventy buildings were erected in one single day.

But versatility and experience are not the only qualities that the construction engineer has in his tool chest. He has ingenuity, and he needed it when steel, copper, zinc and aluminum had to be used for combat equipment, and were denied him. Great hangars, conventionally of structural steel, were turned out with record-breaking timber arch spans. Reinforced concrete factories were designed to require only 3 lb. of steel bars per square foot instead of the customary 5 lb. Asphalt-impregnated paper was substituted for copper in flashings, cement-asbestos for galvanized steel in duct work. In the face of a materials shortage, he continued to build bases—safely, economically, and on time.

Construction ingenuity, too, is back of the records in Liberty ships, in war housing and a host of other facilities. Indeed, it was the construction industry that stepped forward to assume the bulk of the emergency shipbuilding program, leaving established yards free to handle more specialized Navy work. Naturally, it was easy for civil engineers and contractors to build the shipyards, but building ships was another story. It is a far cry from steel ships to conventional engineering structures, yet, drawing upon their bridge and building experience, the men of construction have turned out ships faster than they were ever built before.

How was this possible? . . . because the construction man sees every job as a new problem, views every precedent as something to be discarded in favor of something better. So instead of assembling the myriad separate pieces of each ship on the ways, he fabricated them into huge built-up sections. These he swung to the ways and welded them into place in a fraction of the time required by old methods.

Again, the demands for wartime housing for workers in industrial areas, at Navy bases, and near Army concentrations, have altered the meaning of "residential construction". The building of individual houses has

given way to a form of multiple-unit project that calls for the skilled services of the architect, the civil engineer and the large contracting organization. On one such project, for example, a contractor experienced in large building and bridge construction employed an extensive system of prefabrication and site assembly that made possible the completion of 5,000 houses for war workers within five months.

All these activities, within the United States, parallel the achievements of other industries that serve the men at the front. But construction knows no continental limits. Its men are serving throughout the network of defense bases built in the West Indies, Greenland, and Iceland, and in the offensive bases that are taking form in the jungles and deserts of Africa, the harbors of the Persian Gulf, and the plains and mountains of Australia and Alaska. Already in this war, as in the last one, construction crews, like those at Wake and Guam, have dropped their peacetime tools to fight shoulder to shoulder with their comrades in uniform. Construction follows the flag to the farthest outposts in this global struggle.

* * * *

But while the construction industry thus serves the special needs of the armed forces, it must look after its job at home. It must keep the highways serviceable, the water supply safe, sanitary facilities adequate. There are home chores that cannot be neglected even in war.

And when we finish our No. 1 task of winning the war, the construction industry will again be called upon to help re-establish peacetime employment and to stimulate the normal industrial activities of the nation. It will raze, redesign and rebuild; it will bring modern sanitation to urban dwellers; it will safeguard fertile areas and cities from disastrous floods; it will improve all forms of transportation; it will design and build the facilities that will be needed to reconvert from war to peace. Its vision, versatility, experience and ingenuity will be as indispensable then as they are vital now.

Today it is building the bases that are needed back of every battle-line. Tomorrow it will build for a new and better era. Today it is laying the foundation for the victories that must be ours. Tomorrow it will lay the foundation for the peace that will follow these victories. In war and in peace the construction industry is the builder, the harnesser of nature's forces.



President, McGraw-Hill Publishing Company, Inc.

Electronics—Secret Weapon of War

Presager of a New Scientific and Industrial Era

THE END of World War I left scientists with a new plaything. They did not know it at the time but they had their hands on a revolution. Within two years the world had radio broadcasting. Within ten years the whole art of motion pictures had been transformed as talking pictures replaced silent movies. Within twenty years television was born and people were seeing pictures in motion by radio.

The fulcrum of this revolution is the electron tube, a new tool of illimitable possibilities. One form of the electron tube is the familiar radio tube; the much publicized electric eye is another. There are many other forms, each having distinct capacities for saving time, saving energy, saving money, protecting life, limb and property.

The electron tube puts the electron to work—and the electron is the basic building-block of the universe.

Electronics is the new art, the new science of putting the electron to work. Radio and sound pictures and television are aspects of electronics; but there are many other facets of this revolution which have been brewing since the last war.

The electron tube has a typical American family tree. Edison made the basic discovery of the "Edison effect" some sixty years ago. This was followed by the invention of the "Fleming valve" and the "de Forest grid". Then Armstrong contributed his share, and hundreds of engineers in garret and cellar workshops and in the great university and industrial laboratories went to work on the tubes which employ electrons. The tube was a plaything before the last war but the world conflict brought it out of the toy stage and made it a practical, powerful tool.

Today the electron tube is guiding the destinies of the greatest armies and fleets ever engaged in the history of the world.

It is a part of the nerve center of the battleship, directing its course, finding its adversaries, broadcasting running accounts of air battles to its crews, directing gun fire and determining ocean depth.

In the air it is the means of locating and identifying enemy planes, piloting planes automatically, giving communication from plane to plane and to shore. It is even operating the controls of the plane.

In the maneuvering tank, in the officer's car, on the back of a foot soldier it transmits and receives vocal messages from every unit of the fighting forces.

Along our borders, and those of our Allies is an electronic screen which counts, follows and identifies enemy planes a hundred miles away through darkness and through fog.

In industrial plants there are electronic counters that enumerate passing articles faster than the eye can see; automatic sorters which discard defective, oversize, undersize, off-color articles; automatic cutters; devices which inspect the inside of things which the eye cannot see; controls which protect workers; controls of temperature; smoke eliminators; intruder alarms; automatic controls for whole batteries of machines.

In its October progress report on American industry, the War Production Board points out that the radio business is five times greater than a year ago. From 20 million dollars a month last fall, it has increased to well over 100 million dollars a month. Unfilled war orders are in excess of 4 billion dollars.

From such vast growth will emerge a new engineering of products which will immeasurably improve our peace-time living.

After the war broadcasting will be infinitely more satisfactory: radio receivers will perform with a new fidelity which will amaze us. Television reception will be as flawless as the motion picture. Present secret war developments will readily be convertible to peace-time devices that will improve our standard of living.

No longer will ships collide with other ships, with icebergs or the shore. No longer will trains collide and aircraft crash in flight.

Garage doors will open as we approach and automatically close themselves. Electric lights will automatically go on and off according to our wants and needs. Furnaces and boilers will be controlled and smokestacks will cease to belch wasteful smoke. Air will be made dust free and germ free. Food contamination will be checked, meat made tender.

Grade crossings will be made safe and auto traffic will be automatically controlled.

Medical science sees new wonders ahead. Already it is possible to see "whiskers" on germs, germs which heretofore had been but a blur when viewed through the strongest optical equipment available.

Today so much secret development is going on in the ultra-high-frequency field that little can be said of its great future. But, without divulging military secrets, it can be said that ply-wood is being dried electronically in minutes instead of hours. Ultra-high-frequency welding (not to be confused with flame welding controlled electronically) is being done dramatically and efficiently.

Ultra-high-frequency heating promises to revolutionize the baking industry—it may even heat our homes.

What is this miracle working tube that can see, hear, taste, feel and smell a thousand times more sensitively than was possible heretofore?

What is the electron? No one knows, not even the scientists who know how to employ it. Electrons cannot be seen or felt; but if $6\frac{1}{4}$ million million electrons are pushed through a 100-watt electric lamp per second, it will light up to full brilliance. For electric current merely is a mass movement of electrons. Each electron carries its share of electricity, and since the electron has so little weight it can be moved easily and quickly. Therefore, electricity transported by electrons can be turned on or off with great ease and speed. The electron tube merely is a device that controls the flow of electricity. It is an amplifier of power which can be made to do wondrous things. The sound of a termite gnawing inside of a log can be amplified a million times . . . to a roar that can be heard over great distances.

Colors can be classified and matched to a degree not possible by any other means.

Chemical or vitamin consistency can be recognized by counting radio activity within the subject being analyzed.

There is no industry in which electronic circuits cannot be used to speed up production, to increase accuracy, to do heretofore impossible tasks of calibration and measuring.

The opportunities afforded the engineers who are developing this new "electronic age" are limitless.

* * * *

Today the electronic industry is 100% at war. It

is meeting the exacting demands made upon it.

Never before was electronic equipment called upon to withstand temperatures ranging from 75 degrees below to 150 degrees above zero Fahrenheit. Never before did radios and transmitters have to withstand the shaking and abuse to which they are being subjected today.

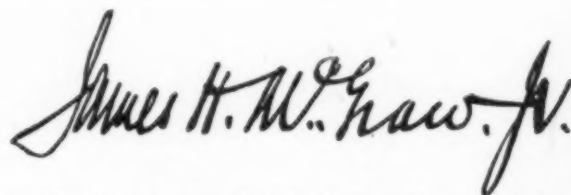
War demands have called for much redesign, much change of materials and a new conception of operating to tolerances never dreamed of in peacetime material. As a result, electronic parts and equipment makers are building better devices.

Universities and colleges are working at top speed to produce electronic engineers, for every radio operator in a plane, every radio man in the ground forces and on ships, every man operating radar equipment or electronic control devices in ordnance . . . and there are many thousands of them . . . must be a trained technician.

The wall of military censorship is high but it is no secret that one of Britain's best weapons that keeps the Luftwaffe from exterminating London is a radio locator, a device that gives alarm of approaching planes long before they can be seen with telescopes. Scanning the horizon constantly the locator warns of the enemy's approach. In the nose of a night fighter, the locator informs pilot and gunner when the enemy is within range. Neither is it a military secret that gunfire can be controlled by electronics, and that electronics is having a big share in training our new armies.

Necessity draws a veil over the most dramatic uses of electronics in warfare, but among those who know there is nothing secret about the fact that many of today's wartime applications will revolutionize our peacetime lives. Electronics will invade every industry with totally new devices and machines. The future of the electronics industry is limited only by man's imagination.

Such is electronics, and its destiny!



President, McGraw-Hill Publishing Company, Inc.

This is the sixth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

Picture!..

PROBLEMS FACING PROCESSORS TODAY —

Strange Processes?



Are you now replacing imported or scarce materials? Or making new wartime products?

Overworked Engineers?



Outside engineering cooperation may be all that's needed to get your staff out of a hole.

ON ALLIS-CHALMERS!

Here's a company that engineers and builds *all types* of basic processing equipment . . . in the *complete line* highlighted below.

Thus when you call on Allis-Chalmers Cooperative Engineering, you deal with engineers who are "complete line" engineers. They know *all* phases of the basic pro-

cesses...how they all *fit together*.

Result: you get recommendations that make existing equipment "team up" better . . . to give you greater wartime production.

Don't let another day go by without putting Allis-Chalmers Cooperative Engineering to work on *your* problem. No obligation,

of course. Call your nearby A-C district office. Or write ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.

A 1562



WASHING



Log & mill type washers — full line of washing screens.

PYRO-PROCESSING



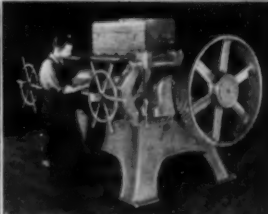
Multiple & flat hearth furnaces—rotary calcining kilns.

DRYING



Rotary & hearth furnace dryers —revolving steam-tube dryers.

MILLING

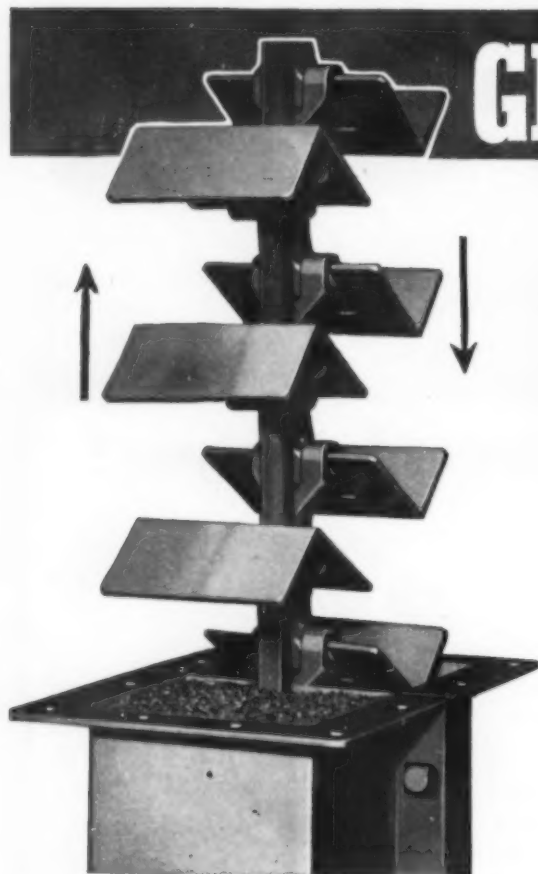


Milling & oil-extraction of cereals — chemical reduction.

SIFTING



Gyratory sifters & sifting reels for cereals, minerals, chemicals.



GENTLE HANDLING.....

LINK-BELT **BULK-FLO**

CONVEYOR-ELEVATOR-FEEDER **Minimizes Contamination and Degradation**

Bulk-Flo is outstanding in its ability to cut handling costs and to conserve critical materials and save space. It minimizes breakage and degradation, prevents leakage and reduces explosion and fire hazards. The necessity for multiple elevating and conveying units is eliminated, because the same unit conveys horizontally, vertically or on an incline.

Bulk-Flo is self-feeding, self-discharging and to a high degree self-cleaning. It handles flowable, granular, crushed, ground or pulverized materials of a non-abrasive, non-corrosive nature under all conditions of loading.

Bulk-Flo loads automatically—at one or at several points—without feeders. It automatically discharges at the head end of vertical runs or at one or more points on horizontal runs, or both as desired. There is minimum slippage on partial loading.

LINK-BELT COMPANY

Chicago Philadelphia Indianapolis Atlanta Dallas San Francisco Toronto
Offices, warehouses and distributors in principal cities. 8990

SLOW SPEED Operating at slow speed Bulk-Flo is recommended for materials that require careful handling . . . minimizes breakage and degradation.

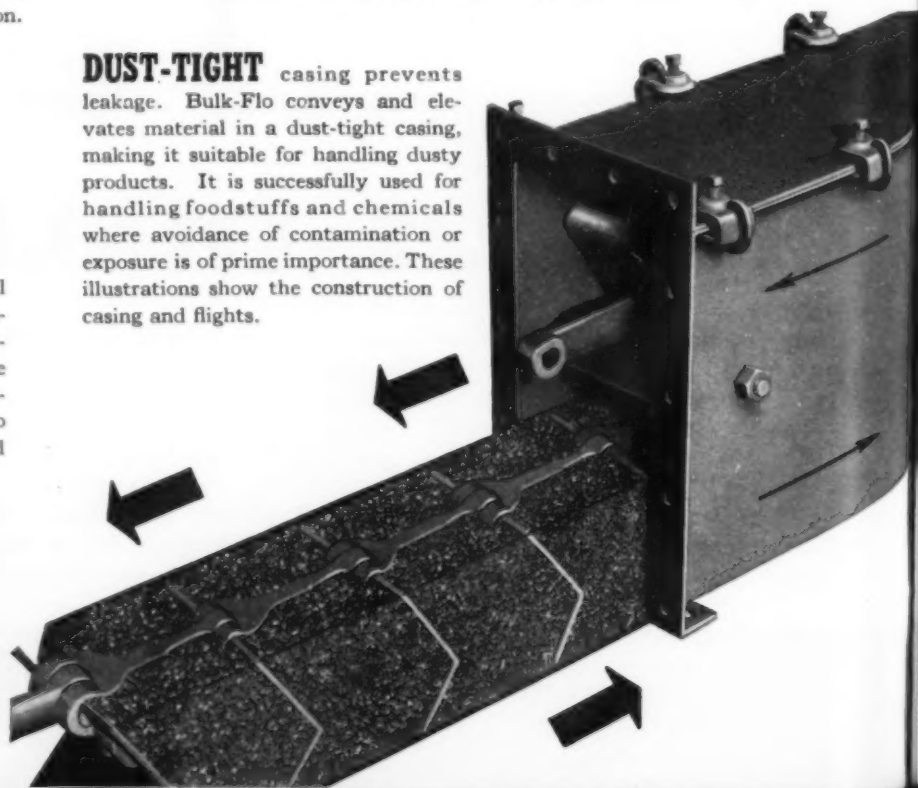


SPLIT DISCHARGE REDUCES DEGRADATION

Most of the material falls forward immediately upon reaching gathering chute (see AA). The remaining material discharges rearwardly onto chute and flows forward (see BB).

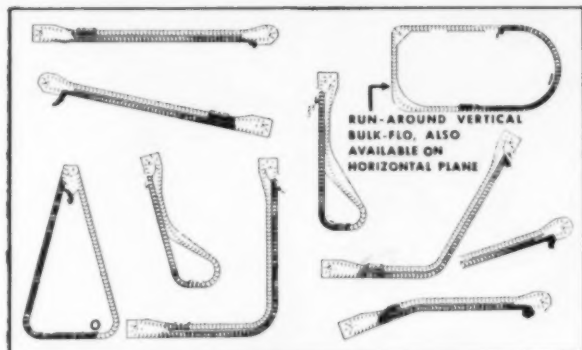
**THROW
YOUR SCRAP
INTO THE
FIGHT!**

DUST-TIGHT casing prevents leakage. Bulk-Flo conveys and elevates material in a dust-tight casing, making it suitable for handling dusty products. It is successfully used for handling foodstuffs and chemicals where avoidance of contamination or exposure is of prime importance. These illustrations show the construction of casing and flights.



LINK-BELT Bulk-Flo

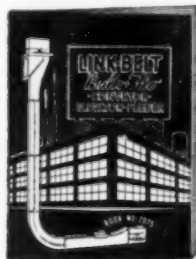
DUST-TIGHT OPERATION



↑ UNUSUAL ARRANGEMENTS

This illustration shows some of the elevating-conveying layouts available, to provide extreme flexibility.

Send for **NEW BULK-FLO BOOK No. 2075**

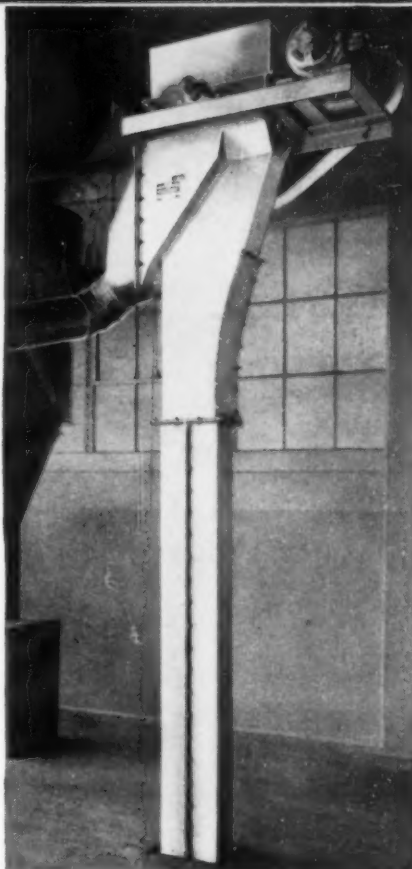


COMPACT DRIVE →

Motorized reducer and chain drive are safe, compact, fully enclosed, easily accessible. Speed changes readily made by changing one sprocket.

SAVES SPACE →

Compact Bulk-Flo casing is so small as to be comparable to a building column. The material moving in a continuous mass occupies almost the entire capacity of the enclosure.

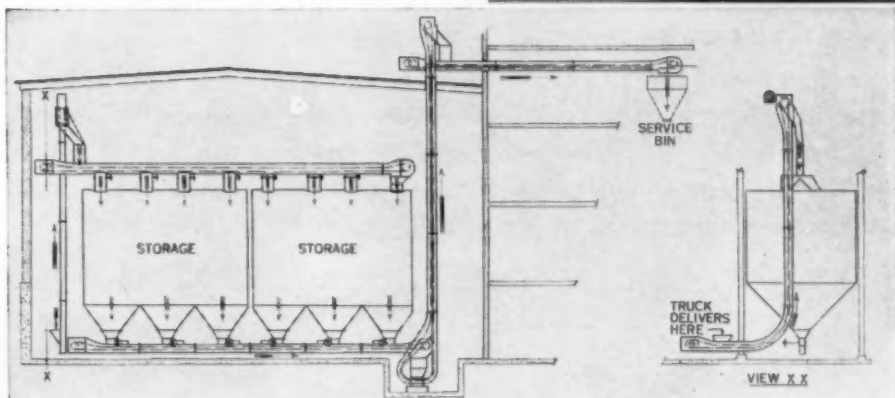


1 TELLS HOW Bulk-Flo handles a variety of loose materials in compartments.

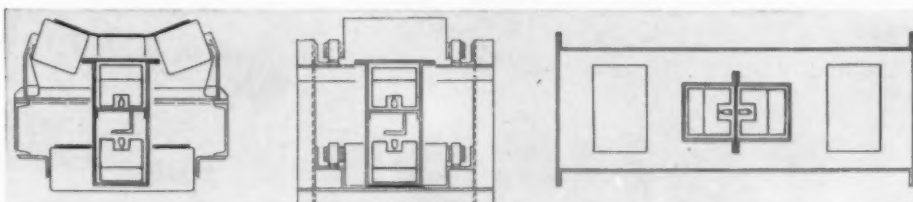
2 GIVES FACTS on installations—and how it assures dustless operation and freedom from degradation. Its operation without feeders is also explained.

3 ACTUAL PHOTOS of the Bulk-Flo handling various kinds of materials. Explains how Bulk-Flo solved handling problems.

4 ENGINEERING DATA gives capacity and horsepower formulae, installation and operating details, assemblies and dimensions.



Five Bulk-Flo units with automatic controls handling granulated sugar from trucks to storage bins at 30 tons per hour and transferring from the bins to a service hopper at 7½ tons per hour.



Comparison of space required for a Bulk-Flo and belt conveyor . . . Bulk-Flo and flight conveyor . . . and Bulk-Flo and bucket elevator. Bulk-Flo is light in weight, requires minimum supports, thus saving steel.

Self-feeding ELEVATOR-CONVEYOR

FIG. 6054

TABER PUMPS

SERVING IN THE WAR

Taber Pump has enlisted for the duration... but Taber Bulletins are available to show how Taber Pump experience since 1859 serves now and will continue to serve industry after the war.

For example, Fig. 6054 Taber Horizontal Pumps handle chemical solutions. The illustration above shows a covered drip chamber. This prevents flinging of injurious chemicals from the revolving shaft. Engineering data and structural fitness are contained in Bulletin CLVS-339.

Vertical Pump, Fig. 19,447, (to right) is the submerged type, handling chemical solutions in processing vessel. Provision is made to prevent gases escaping from vessel. Bulletin V-837 contains illustrations of several types of Taber Vertical Pumps. Both types of Taber Pumps are made in iron, steel, nickel and all of the many alloys of nickel chrome steel.

These Taber Special Chemical Pumps serve in various plants manufacturing explosives and chemicals for the war. In this respect Taber Pumps are serving in the war.

Bulletins are available and we shall be pleased to comply with your letter of request for either or both bulletins... Bulletin CLVS-339 Horizontal Pumps, Bulletin V-837 Vertical Pumps.

TABER PUMP CO.

(Established 1859)

294 ELM STREET, BUFFALO, N. Y.

FIG.
19,447

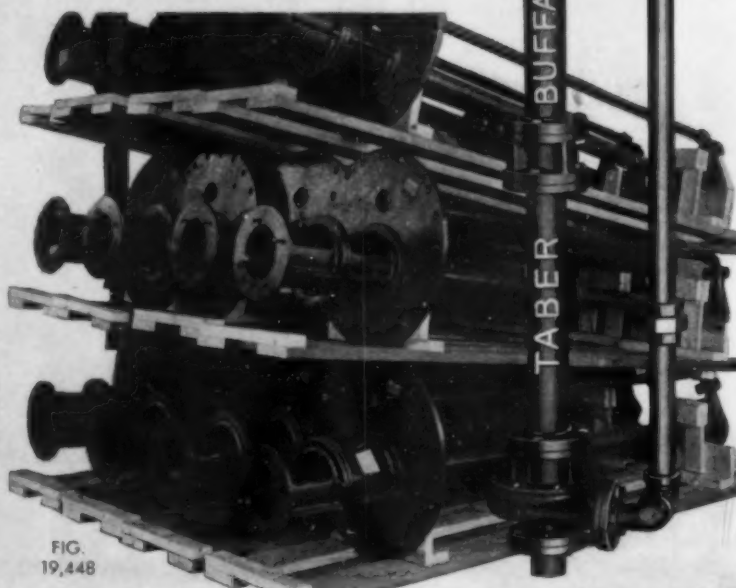


FIG.
19,448

WANT A FILTER THAT WILL DO THE JOB WITHOUT



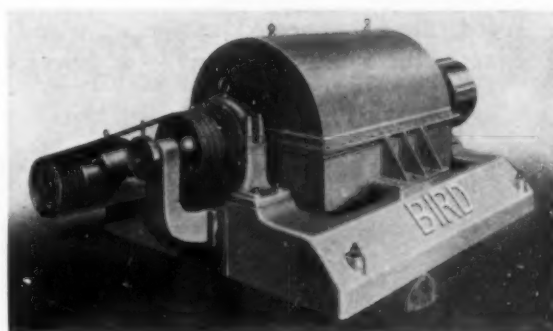
The **BIRD Continuous FILTER** *is that kind of a Filter*

NEVER MIND whether the solids are coarse or fine, crystalline or amorphous—

NEVER MIND whether the feed is thick or thin, hot or cold—

NEVER MIND whether it involves volatile vapors, toxic fumes, explosive gases—

NEVER MIND how much or how little you want—a few hundred pounds of solids an hour or a hundred thousand—



the BIRD Filter can take care of it, probably better and faster than you've ever filtered it before. That statement is based on what Bird Filters are actually doing on all kinds of war production, right now!

If you're not getting that kind of solids-from-liquids separation now—and you need it—better get in touch with us at once.

BIRD MACHINE COMPANY
SOUTH WALPOLE • MASSACHUSETTS

It's Time to Look at Motor

→ You Can Save with High-Speed Instead of

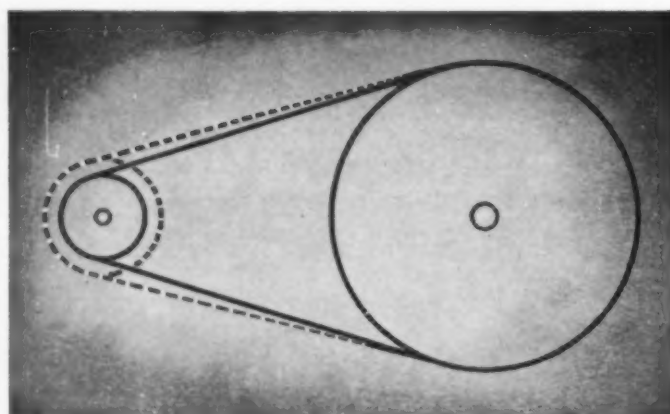


1. In most applications, an 1800 rpm motor with Texrope Drive will ably do the job of a lower-speed, direct-connected motor . . . and give you exactly the speed you want — at lower cost!



2. When you buy an 1800 rpm instead of 450 rpm 15 hp squirrel-cage motor, for example, 600 lb of critical materials are saved. And you save well over \$200—with the drive figured in! This saving is typical.

→ You Can Save with Single-Speed Instead of



1. Infrequently needed speed changes can be had by changing from one size motor sheave to another. By juggling complete drives, speeds can be changed over the full range — from 1:1 to 7:1.

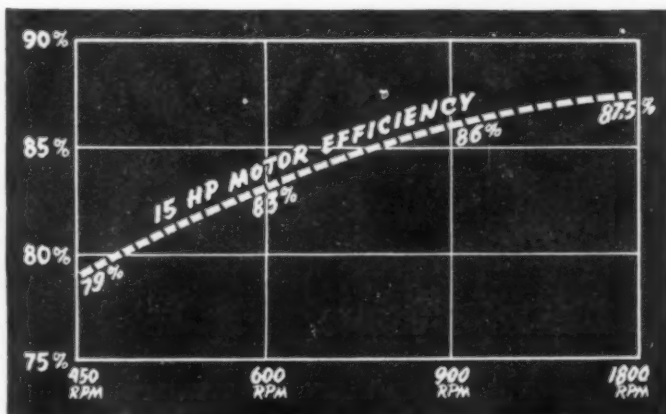


2. With the Allis-Chalmers Vari-Pitch Sheave, you can increase or decrease speed by adjusting sheave diameter, as above. Within limits, an unbroken series of speeds can be obtained.

Take a Fresh Buying!

WAR FORCES HIGHER EFFICIENCIES...

Low-Speed Motors...



3. Note that efficiency rises from 79% for a 450 rpm motor to 87.5% for a 1800 rpm motor. Comparing power consumption, the 1800 rpm motor saves you over 30 kw/24 hr. day.

Multi-Speed Motors...



3. Allis-Chalmers Vari-Pitch Speed Changer gives you infinite changes at the turn of a wheel — within 3.75 to 1. It's the most compact, flexible variable-speed transmission available.

It was good business in peacetime to use — as widely as possible — high-speed motors with Allis-Chalmers Texrope Drives...and single-speed motors with Allis-Chalmers Vari-Pitch Sheaves and Speed-Changers. And it's clearer every day that those material and money-saving practices are *vital* practices in time of war!

TODAY the whole picture of buying and applying motors has changed. Note at the left how much you can save for your country *and yourself* with high and single-speed motors made flexible by Texrope Drives.

As America's only builder of both electric motors and V-belt drives,* Allis-Chalmers has long advocated the proper combining of motor and V-belt drive.

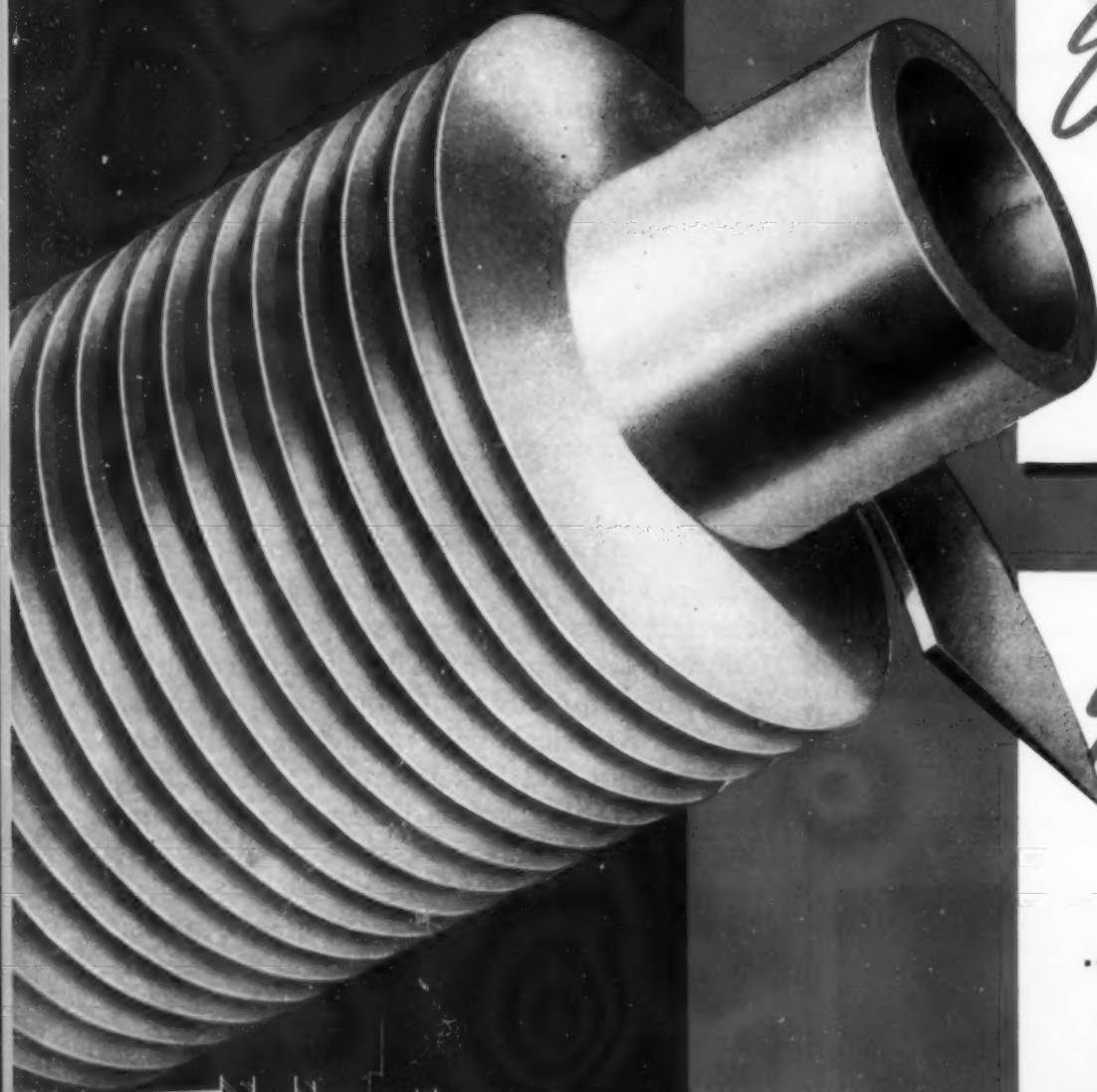
And today you benefit from Allis-Chalmers' vast, pioneering experience in this field when you ask for and get the *right* combination of Lo-Maintenance Motor and Texrope Drive! Call your nearby district office. Or write ALLIS-CHALMERS MFG. CO. MILWAUKEE, WISCONSIN.

A 1560

*Allis-Chalmers originated the Multiple V-Belt Drive and Vari-Pitch Sheaves.



New A Reliable



Exclusive

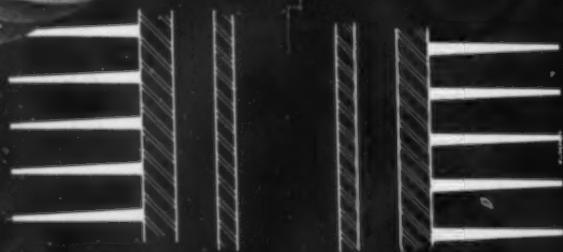
**IT'S BUILT
AROUND STANDARD
STEEL PIPE**

... The life and service of
which is familiar to
every one.

Exclusive

**SMOOTH
TAPERED FINS
SPEED AIR FLOW**

... Absence of Crimping Cuts
Air Resistance and Dust
Accumulation.



FAST-FLOW HEAT TRANSFER

Cross-section illustrates the Sturtevant smooth, tapered fins, secret of the high performance of this new Sturtevant all-steel extended surface. Notice how the fin is shaped to promote equal heat intensity at every point along its section. No crimping to collect dust or impede airflow.

SINGLE-TUBE INTERNAL TUBE CONSTRUCTION FOR HEAVY DUTY

A time-tested form of construction which has given dependable performance for a quarter of a century.

Steel Heater!

STURTEVANT HEAVY-DUTY ALL-STEEL HEATER

—especially suitable for industrial
high temperature applications!

It's the result of 3 years' research on steel heating coils. NOT a substitute for shortages—but a radical improvement in extended surface design for *NOW*—and *After the War!*

Featuring standard steel pipe construction to withstand severest services—smooth fins to minimize air flow resistance—tapered fins for fast-flow heat transfer.

FULLY GUARANTEED!

Now, for all heating and drying work, there is no reason to risk early and frequent replacement. Instead, this Sturtevant heavy-duty steel extended surface gives you all the advantages of encased heater sections, is as reliable as the old Sturtevant Pipe Coil Heater, many of which are still in service after more than 50 years of satisfactory operation, and carries the same guarantee which is customary on copper units.

**Overcomes many troubles that occur at
higher steam temperatures**

Need for a heavy-duty all steel surface has always been evident in certain installations where conditions caused corrosion of copper. Here's how the

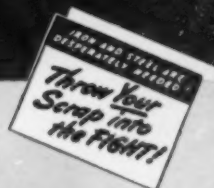
new Sturtevant heavy duty heater licks this problem: Steam is carried in standard steel pipe from the time it enters the heater until it goes back into the condensate line; the unit is as durable as the supply and return lines themselves.

And there are plenty more reasons why this latest Sturtevant development makes front page news in industry;—1, it utilizes a proved principle known as Internal Tube Construction—used by Sturtevant for 25 years; 2, it can be installed either vertically or horizontally, header required only on one end; 3, made in the same standard sizes as copper units—hence requires no more space. Performance and dimension data available on request.

Sturtevant

REG. U. S. PAT. OFF.

Puts Air to Work



B. F. STURTEVANT CO.
Hyde Park, Boston, Mass.

C.&M.E. 12-45

I am interested in the new Sturtevant All Steel Heater for the following essential applications: _____

Please send further information to:

Name _____ Title _____

Company _____

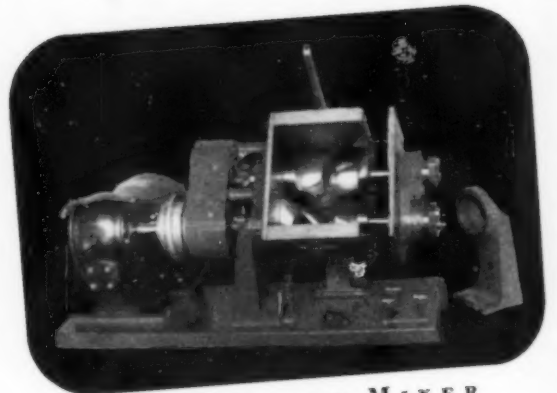
Address _____



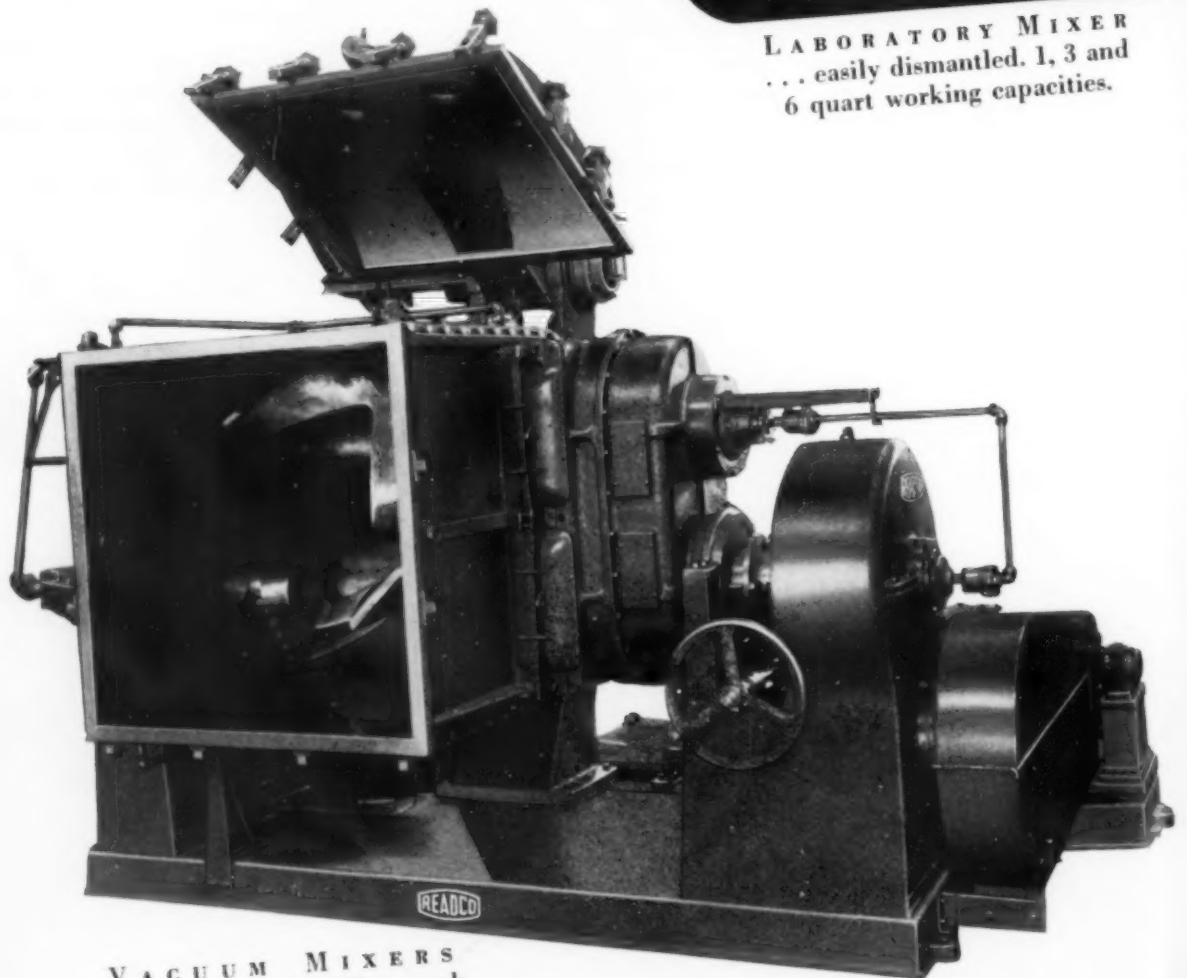
Mixers to Speed



PILOT PLANT MIXERS
2½, 5 and 10 gallon working
capacities.



LABORATORY MIXER
... easily dismantled. 1, 3 and
6 quart working capacities.



VACUUM MIXERS
10 gallon to 400 gallon work-
ing capacities.



Your War Effort

PICK YOUR chemical mixing job and Read will design the mixer to do it better—with less waste and contamination. These mixers are a few of the many serving the nation in war plants—day in and day out—for the greatest production with the least attention. Read has built them with exactness—with attention to stability and designed to fill the special needs of the material to be processed.

Today's production is wedded to the war effort—it must go on at the greatest speed consistent with high quality. In your own chemical processing if you find mixing is a bottleneck—just call Read.

★ ★ ★ ★ ★
MATERIAL HANDLING EQUIPMENT - PILOT
PLANT MIXERS - BOTTOM DISCHARGE OR
TILTING BOWL MIXERS - BLENDERS - SIFTERS
- SHREDDERS - ACETYLATORS - VERTICAL
MIXERS - AND PHARMACEUTICAL EQUIPMENT

Read MACHINERY CO., INC.
YORK, PENNSYLVANIA

Three facts for refiners —

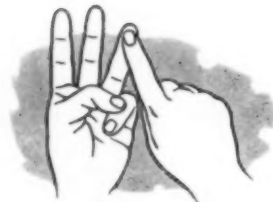
Refiners building or re-building plants for the production of synthetic rubber ingredients should know these facts:



Babcock & Wilcox Tube Company engineers already have assisted in the design of important installations of B&W Seamless Tubing in plants producing butadiene, styrene and other synthetic rubber ingredients.



B&W Croloys furnish a wide range of tube alloys from which it is possible to select "happy mediums" of heat and corrosion resistance, tube life and delivery possibilities.



B&W has amassed, compiled and published an exceptional fund of laboratory and field data on tube alloys for high-temperature, high-pressure service.

The B&W technical staff stands ready to bring valuable experience to bear on your tube selection problems whenever requested. In the meantime, secure a copy of Technical Bulletin 6-D, 157 pages of facts on "Properties of Carbon and Alloy Steel Tubing For High-Temperature, High-Pressure Service."

TA-1228

BABCOCK & WILCOX TUBES

HOT FINISHED
COLD DRAWN

ALLOY STEELS
CARBON STEELS

THE BABCOCK & WILCOX TUBE COMPANY
BEAVER FALLS, PA.

Announcing

M·S·A

FEND

BARRIER PROTECTION for the worker's skin AGAINST INDUSTRIAL DERMATITIS

... Important news to every industrial medical director, safety engineer and plant executive concerned with checking the urgent problem of industrial dermatitis, and keeping men and women on the job without loss of time and production!

Distributed exclusively by the world's largest manufacturer of approved safety equipment, produced by intensive new research for *better skin protection*, M.S.A. FEND Creams and Lotions provide complete barrier protection against many-score specific skin hazards in industry... medically and cosmetically correct, non-toxic, safe and economical to use, uniformly effective *on the job!*

FEND Creams are easy to apply, bland and neutral. Each FEND product contains its own skin-conditioning factor. FEND Creams or Lotions are non-sticky, non-clogging, do not interfere with normal action of skin and skin glands, and are in many ways the long-sought preventives of skin dermatoses in industry.

WRITE FOR COMPLETE FEND FACTS!

Detailed in this 16-page FEND Bulletin is the whole story of Barrier Skin Protection—**MUST** reading for everyone concerned with safer, better plant production today. Send for your copy!



MINE SAFETY APPLIANCES COMPANY
BRADDOCK, THOMAS and MEADE STREETS, PITTSBURGH, PA.

District Representatives in Principal Cities

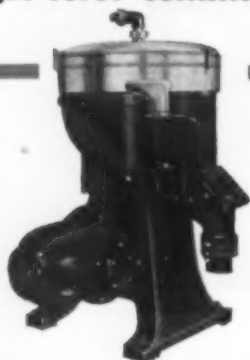


The Chemical Industry requires a wide variety of centrifugal machines to accomplish its various purposes.

Here are the general types of centrifuges

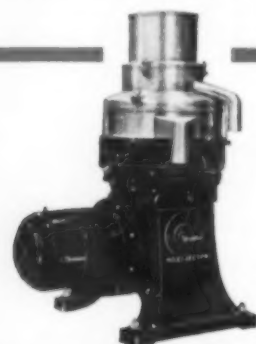
SHARPLES PRODUCES

- 1 The tubular solid bowl "Super-Centrifuge." Highest centrifugal force commercially produced. Clarifiers. Separators.



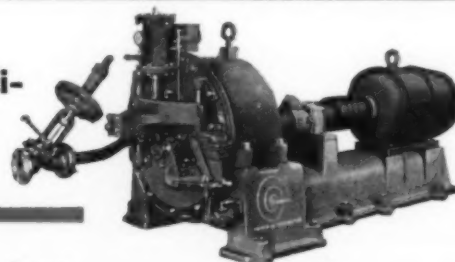
- 2 The disc type bowl. Lower speed, large volume, largest capacity, clarifiers, separators.

- 3 The valve type bowl. Clarifiers and separators. Discharges solids as a cake automatically at full speed.



- 4 The nozzle type bowl. Clarifiers and Separators. Discharges solids as wet slurry continuously at full speed.

- 5 The extractor type bowl. A crystal dryer. Automatically loads, rinses, dries and discharges crystals.



We would be glad to send full information on any of these types.

THE SHARPLES CORPORATION

Centrifugal and Process Engineers



2318 WESTMORELAND STREET • PHILADELPHIA • PA.

LONDON • PARIS • NEW YORK • BOSTON • PITTSBURGH • CLEVELAND
DETROIT • CHICAGO • DALLAS • SEATTLE • SAN FRANCISCO • LOS ANGELES



U.S.I. CHEMICAL NEWS

December ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1942

Improved Synthetic Camphor Yield Seen With New Procedure

Ethanol Treatment of Bornyl Chloride Residues May Be Key

WEEKS, La.—What may be the key to higher yields of synthetic camphor is suggested in a recent patent granted to two inventors here.

The patent deals with a new technique for increasing the yield of bornyl chloride, and since this compound is an important intermediate in the production of synthetic camphor, the process described may be expected to have beneficial results in increasing the output of the latter material also.

Preparation of Bornyl Chloride

Bornyl chloride, the inventors point out, is prepared by saturating pinene with dry hydrogen chloride. An oily mixture is formed, from which the bornyl chloride is separated by crystallization. It has now been found, however, that substantial amounts of the bornyl chloride are not removed by the crystallization, and remain in the residue.

This additional material, the inventors claim, can be recovered by selective dehydro-
(Continued on next page)

Ether Called Best Wartime Anesthetic Of Inhalation Type

Among the existing anesthetics of the inhalation type, ether has definite advantages for use in combat areas, it has recently been reported. Factors contributing to the suitability of ether for wartime inhalation anesthesia include the ease with which it can be transported in small cans; the possibility of storing it for indefinite periods; ease and safety of administration by the open drop method; and the relatively lower danger of explosion as compared with other commonly used inhalation anesthetics.



Ease and safety of administration of ether are among the reasons why it has been characterized as the best anesthetic of the inhalation type for use in combat areas.

Offer Ointment Formula For Mustard Gas Burns

WASHINGTON, D. C.—An ointment suggested by the Office of Civilian Defense to relieve the pain and itching of mustard gas burns has the following proportions:

| | Parts |
|----------------------|-------|
| Benzyl alcohol | 50 |
| Stearic acid | 30 |
| Glycerin | 10 |
| Ethyl alcohol | 8 |
| Pontocaine | 1 |
| Menthol | 1 |

Copal Resins Dissolved By Aid of Nascent Oxygen

SUNDBYBERG, Sweden—Difficultly soluble fossil resins, particularly such members of the copal group as Zanzibar, Mozambique, and Congo resins, can be easily dissolved without previous melting by subjecting them to the action of nascent oxygen in the presence of an inert solvent.

This discovery has been made by an inventor here, who has received a U. S. patent on the method. In a typical procedure, the resin is finely divided and mixed with a small amount of manganese peroxide or vanadic acid, acting as a catalytic agent. Over the mixture is poured a suitable solvent: for example, ethanol, or a mixture of 50% ethanol, 40% benzol, and 10% acetone.

A mixture of hydrogen peroxide and nitric acid is then added. Nascent oxygen is released from the hydrogen peroxide, and reacts on the particles of the resin, which quickly dissolve in the solvent, it is claimed.

Say Tincture Preparation Time May Be Shortened

Possibility that the time for preparing tinctures of alkaloids may be shortened is suggested by the work of foreign investigators. According to reports of this work, a tincture of cinchona was first prepared by 10-day maceration with dilute alcohol. This tincture assayed 1.25% alkaloids. It was found that maceration with shaking, using 70% alcohol, yielded a tincture equal in potency to that prepared by the 10-day maceration.

This suggests that by a procedure of shaking and maceration, tincture of cinchona can be prepared in small quantities in a short period of time. It has not yet been determined whether the technique can be applied with equal success to other tinctures.

Describes Novel Method of Testing Greaseproof Paper

APPLETON, Wis.—A titanium pigment dispersed in ethanol plays a part in a new method for evaluating greaseproof paper, according to a patent issued to two inventors here.

The pigment is applied to one side of the paper and an oil dye to the other. If any of the oil dye penetrates the sheet, it will be absorbed into the pigment coating, producing a stain. The effectiveness of the greaseproofing is determined by comparing the appearance of the test sample, after a definite time, with a standard sample.

Lists Many Esters Helpful in Abating Foaming of Casein

Recent Research Throws Further Light on Most Effective Agents

NEWTON, Mass.—A new insight into ways of preventing foaming of casein paints and other protein compositions has been given as a result of research outlined in a patent recently granted to an inventor here.

According to the inventor's theory, foam formation and prevention in protein compositions are related to the action taking place at the interface between the protein composition, the air phase, and the film of anti-foaming material. It is suggested that the formation of the foam results from an increased concentration of the protein material at the interface. The surface tension of the water is thus lowered sufficiently to allow the formation of bubbles of foam.

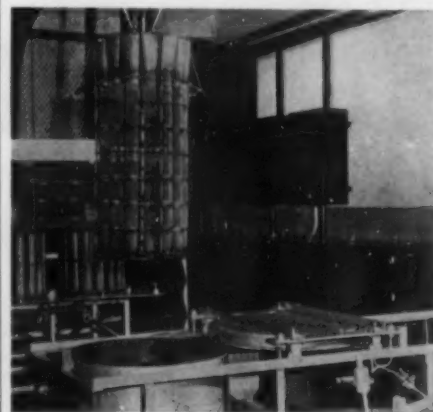
Effect of Anti-foaming Agents

If an anti-foaming agent is present in an amount greater than is needed to saturate the protein film, the protein, according to this
(Continued on next page)

Alcohol Quench Prevents Aluminum Alloy Rivets From Sticking Together

Aluminum alloy rivets used in aircraft construction by The Glenn L. Martin Company are prevented from sticking together by immersing them in an alcohol quench tank.

The rivets are of the type which, immediately after heat treatment, are placed in refrigerated storage to keep them soft and workable until they are to be used. (U.S.I. CHEMICAL NEWS, September, 1941.) At the conclusion of the heat treatment, the rivets are first quenched in water, and then in alcohol at 0° F. or less. The alcohol quench aids in preventing the rivets from freezing together when they are later placed in cold storage.



Quench basket containing rivets is lowered into alcohol quench tank, which helps to prevent them from sticking together.

December

★

U.S.I. CHEMICAL NEWS

★

1942

Solvent Blend Addition Helps Prevent Clogging Of Oil Burning Systems

CHICAGO, Ill. — The clogging and fouling of domestic and commercial fuel oil burners can be prevented to a large extent by the addition of small amounts of a suitable solvent blend to the fuel oil.

This discovery is outlined in a recently issued patent assigned to a manufacturer here. In general terms, the solvent blend consists of: a compound boiling over 350° F. and having excellent gum solvent properties at elevated temperatures; and a compound boiling below 350° F. and having good gum solvent properties at ordinary temperatures.

A particularly effective solvent blend, it is indicated by the patent, consists of dibutyl phthalate and ethyl acetate. It is claimed that the addition of such a blend is helpful not only in preventing fouling of the oil burning system, but also in removing existing gummy deposits.

Dibutyl phthalate and ethyl acetate
are produced by U.S.I.

Dibutyl Phthalate Nearest To Universal Plasticizer

Dibutyl phthalate represents the nearest approach to a universal plasticizer for grinding pigment pastes to be added to lacquers, it was suggested in a recently conducted question-and-answer forum on paint problems. The dibutyl phthalate absorption of pigments is approximately twice that of raw linseed oil.

Dibutyl phthalate is particularly suitable for grinding pigments for addition to nitro-cellulose lacquers. For cellulose acetobutyrate lacquers, it is suggested that a mixture of dibutyl and dimethyl phthalates should prove most satisfactory.

Synthetic Camphor Yield

(Continued from preceding page)

chlorination of the residue in the presence of 95% ethanol. The ethanol serves as a common solvent for the components of the residue and for the dehydrochlorinating reagent.

The treatment, it is said, does not affect the bornyl chloride, but the other components of the residue become dehydrochlorinated, and can be separated from the bornyl chloride by distillation.

Recovery is reported to be as high as 25 to 35% by weight of the residue.

Revised Specifications For Road-Marking Paints

WASHINGTON, D. C. — New specifications have been issued for road-marking paints, to conform with regulations permitting the use of limited amounts of Batu and Congo Copal gums in paints of this character.

Under present regulations, up to one pound of Batu or two pounds of Congo can be used per gallon of road-marking paint. The revised specifications take into account this easing of restrictions on the use of natural resins.

U.S.I. will refer readers to a source from which the new specifications can be obtained.

Foam-Abating Agents

(Continued from preceding page)

theory, is either precipitated out of the solution, or is reduced in concentration so that it no longer lowers the surface tension of the water. Consequently, foam formation is abated.

It is obvious that the application of this theory to foam prevention requires the use of an agent exceeding that necessary to saturate the solution. This result can be obtained, the inventor claims, by means of esters which are soluble to only a limited extent in water, and which have a higher boiling point. When these esters are added to the protein compositions in amounts exceeding their solubility in water, at least a molecular layer of undissolved ester is always present between the surface of the protein solution and the adjacent surface of the air layer.

Suitable Esters

In this way, a permanent anti-foaming effect can be produced, according to the inventor. The patent lists a considerable number of esters which meet the necessary requirements. Among the U.S.I. products included in the list are:

Amyl acetate
Butyl acetate
Butyl ethanediolate
Dibutyl phthalate
Diethyl carbonate
Diethyl phthalate
Ethyl acetate
Ethyl ethanediolate

The use of these esters is expected to be effective in abating foam formation in casein and other protein compositions for such applications as paints, inks, and paper coating.

TECHNICAL DEVELOPMENTS

Further information on these items
may be obtained by writing to U.S.I.

An abrasion-resistant plastic is described as transparent, insoluble in common solvents, 20 to 30 times as resistant to abrasion as most clear plastics. Maker says that it retains its shape when exposed to high atmospheric temperatures, can be formed into large sheets at low pressures.

(No. 640)

U S I

A textile finishing agent is said to be useful in replacing sulfonated tallow. It is claimed that 100 pounds of the new agent will do the work of 140 pounds of sulfonated tallow, and that the cost compares favorably.

(No. 641)

U S I

A paper fabric is suggested by the manufacturer as a substitute for cloth and burlap. It is said that the cellulose fibers are effectively interlocked and fastened, resulting in high inherent wet strength independent of any coating or sizing on the surface.

(No. 642)

U S I

A sealing liquid is said to protect wood or concrete against attack or infiltration by oil and gasoline, and can also be applied as a protective coating on steel. According to the maker, it resists attack by many solvents and fatty acids.

(No. 643)

U S I

A multiple-drum mixer will handle four 50-gallon drums and the same number of 5-gallon drums, rotating them at 30 RPM to mix their contents.

(No. 644)

U S I

Temporary protection for metal parts in storage or transit is provided by a new liquid which dries to form a stable, non-adhesive film, according to the manufacturer. It is claimed that the film is unaffected by oil, grease, gasoline, water, alcohol, brine solutions, will not become brittle under sunlight, and that it peels off as a complete film.

(No. 645)

U S I

A new Buechner filter is said to retain all the advantages of this type of funnel, with the added feature of physical stability. The entire unit is supported by a cylindrical base that rests firmly on the table, and the filtrate is drawn off through a vacuum connection at the bottom.

(No. 646)

U S I

Low actinic glassware has been developed especially to meet the need for colored laboratory glassware affording high protective value to certain light-sensitive substances, it is reported. The protecting red color is described as an integral part of the glassware.

(No. 647)

U S I

A polarizing film is said to require no scarce imported materials in its manufacture. It is also available in the form of laminated glass, and while material is used for war purposes, limited supplies are reported available for experimental purposes.

(No. 648)

U S I

A form liner for concrete is said to contain no restricted materials, and to strip cleanly away from a finished concrete surface. It is reported to be cheap enough to discard after use.

(No. 649)

U.S.I. INDUSTRIAL CHEMICALS, INC.

60 EAST 42ND STREET, NEW YORK



BRANCHES IN ALL PRINCIPAL CITIES

ALCOHOLS

Amyl Alcohol
Butanol (Normal Butyl Alcohol)
Fusel Oil—Refined

Ethanol (Ethyl Alcohol)

Specialty Denatured—All regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof, C.P. 96%
Absolute
U.S.I. Denatured Alcohol
Anti-freeze
Super Pyra Anti-freeze
Solox Proprietary Solvent
Solox D-1 De-icing Fluid

ANSOLS

Ansol M
Ansol PR

ACETIC ESTERS

Amyl Acetate
Butyl Acetate
Ethyl Acetate

OXALIC ESTERS

Butyl Oxalate
Ethyl Oxalate

PHTHALIC ESTERS

Amyl Phthalate
Butyl Phthalate
Ethyl Phthalate

OTHER ESTERS

Diethyl
Ethyl Carbonate
Ethyl Chloroformate
Ethyl Formate

INTERMEDIATES

Acetoacetanilide
Acetoacet-ortho-aniside
Acetoacet-ortho-chloranilide
Acetoacet-ortho-toluidide
Acetoacet-para-chloranilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate

ETHERS

Ethyl Ether
Ethyl Ether Absolute—A.C.S.

OTHER PRODUCTS

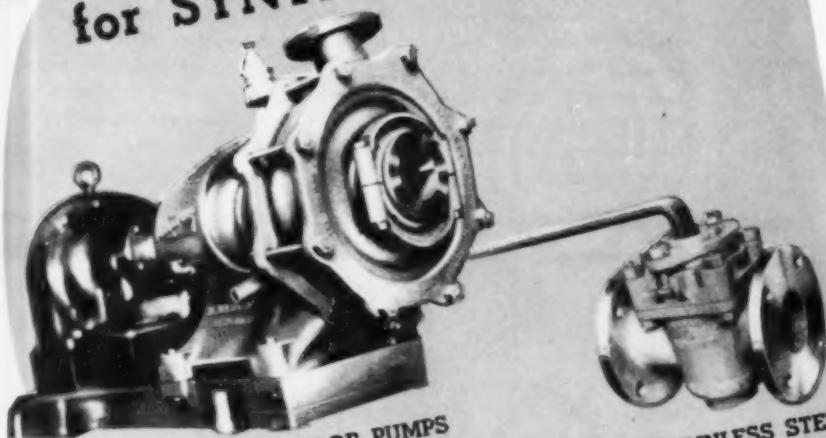
Acetone
Collodions
Curbay B-G
Curbay Binders
Curbay X Powder
Ethylene
Ethylene Glycol
Nitrocellulose Solutions
Potash, Agricultural
Urethan
Vocitone

®Registered Trade Mark

DURCO PRODUCTS

for SYNTHETIC RUBBER MANUFACTURING

Wherever corrosive solutions enter into the manufacture of synthetic rubber, Durco corrosion-resistant equipment will be found capable and efficient in meeting the requirements. In the table below will be found the Durco Alloys recommended for several of the processes:



DURIRON—DURICHLOR PUMPS
Sizes up to 2000 gpm.

DURIMET—STAINLESS STEEL VALVES
10 Types—Sizes to 6".

IN THE FOLLOWING PROCESSES, USE—

BUTADIENE

For chlorinating and hydrochloric acid processes—**DURICHLOR**.

For sulphuric acid concentrating and handling—**DURIRON** and **DURIMET**.

STYRENE

For sulphuric acid treatment—**DURIRON** and **DURIMET**.

ACRYLONITRILE

For chlorinating and hydrochloric acid processes—**DURICHLOR**.

CO-POLYMERIZATION

For sulphuric acid processes—**DURIRON** and **DURIMET**.

For alum solutions—**DURIRON** and **DURIMET**.

PRODUCTS AVAILABLE

Products available in Durco Alloys for above processes include Pumps, Valves, Plug Cocks, Pipe and Fittings.

THE DURIRON COMPANY, INC.
DAYTON, OHIO

DURIMET—STAINLESS STEEL PUMPS
Sizes up to 2000 gpm.



DURIMET—STAINLESS STEEL FITTINGS
Flanged Fittings to 6".
Threaded Fittings to 2".



DURIRON—DURICHLOR FLANGE
and DRAIN PIPE and FITTINGS

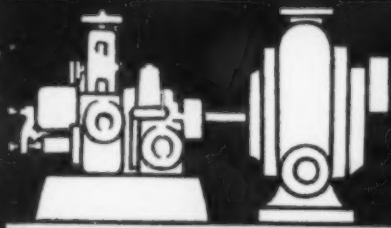


FACTS To Help You Select the RIGHT

BOILER FEED PUMPS



In selecting boiler feed-pump drives, continuity of service should be the first consideration. Type D variable-speed turbines with constant-pressure regulator (speed of the turbine automatically adjusted to maintain a constant discharge pressure from the pump) or with differential-pressure regulator (turbine speed automatically adjusted to maintain pump pressure at a predetermined pressure above boiler pressure) are recommended. Operation can be either condensing or noncondensing.

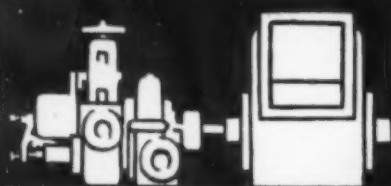


Constant-speed Type D turbines with reduction gears meet the severe, long-life requirements of power plant condenser duty. Turbine drives make possible prompt restoration of service after electrical disturbances because the vacuum in the condenser can be maintained.

HOT WELL AND CONDENSATE PUMPS

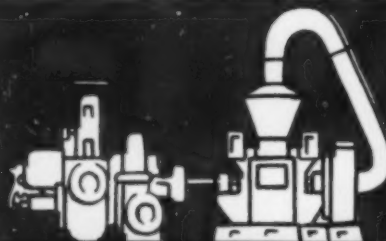


Where constant-speed drives are required, turbines offer inexpensive operation. High availability factor is assured because turbine operation depends only on a supply of steam. Operation may be either condensing or noncondensing.



Continuity of operation should be the first consideration in all essential induced- or forced-draft fan drives. Variable speed and the ability to withstand high ambient temperatures are two primary reasons for selecting mechanical-drive turbines for this service. Combustion control is recommended for automatically controlling speed to obtain the best fuel-air ratio and draft.

COAL PULVERIZERS



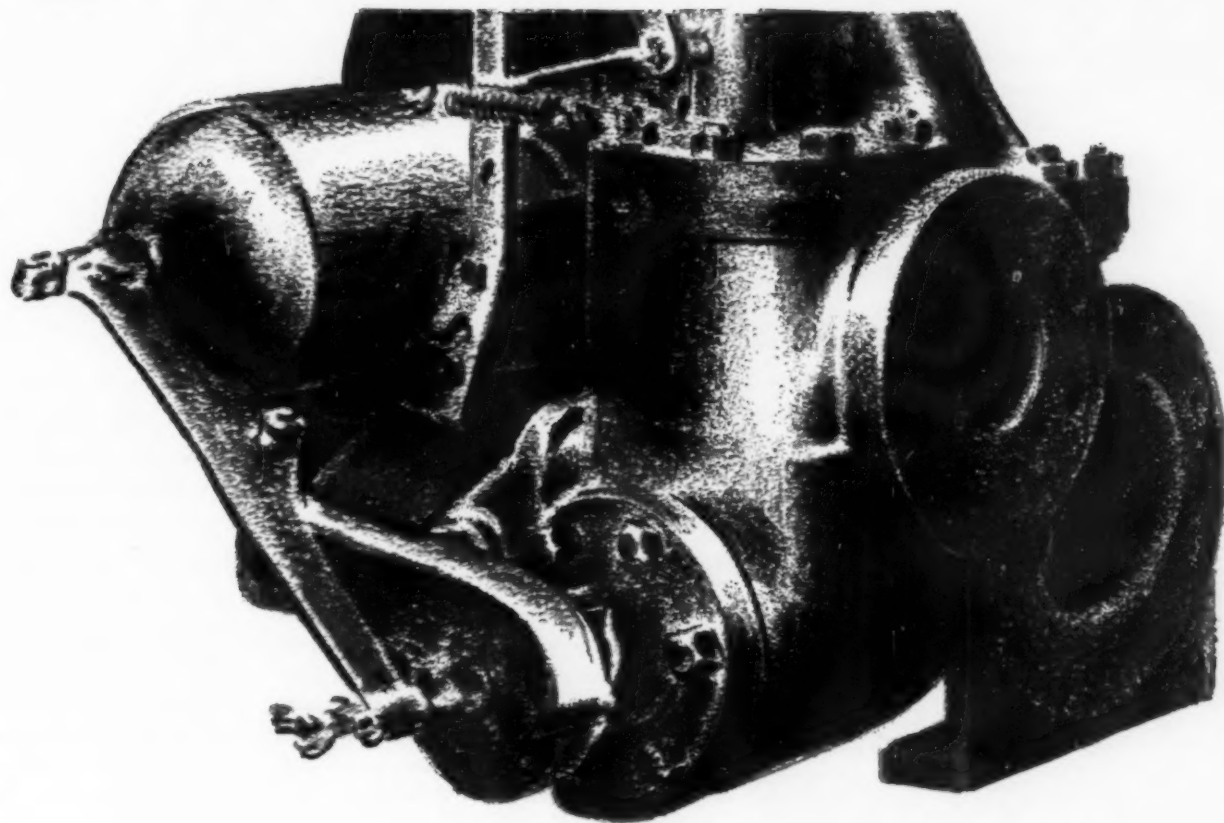
Constant-speed mechanical-drive turbines with inherent, high starting torque are correct for coal pulverizers. Turbines keep going even when adverse operating conditions exist, such as high ambient temperatures and dusty or abrasive atmospheres.



Mechanical-drive turbines assure continuity of service and a positive source of excitation for prime movers. Normally, the exciter is driven by the motor but when power is interrupted the turbine picks up the load automatically. Turbines will also divide the load with the motor to improve station heat balance.

TURBINE DRIVE

for POWER-PLANT AUXILIARIES



IN OUR complete war effort, many power plants are being driven at rates that severely test the reliability of their auxiliary drives. Now, more than ever before, these drives should be so designed and built that they will withstand continuous, gruelling punishment. General Electric Type D mechanical-drive turbines provide a high degree of immunity from any difficulties that would jeopardize 24 hours-a-day, 7 days-a-week operation.

When the *right* drive is specified, power production can often be greatly simplified. Maintenance may be reduced. Over-all station economy, too, may be improved by taking full advantage of the mechanical-drive turbine's double dividend of heat and power. The now-better-than-ever Type D turbine has a strainer to prevent entrance of foreign materials, a combined trip and throttle valve to assure protection against overspeed, and ring-lubricated bearings with the oil supply insulated and cooled by circulating water. With these exclusive features, no wonder

Type D's are finding their way into so many of the most efficient power plants in America.

If you are interested in heat balance, find out what Type D turbines can save by doing double duty—acting as reducing valves to provide clean, low-pressure steam for feed water heating and providing low-cost mechanical power for auxiliary drive.

Or, if you are primarily interested in protecting your plant against shutdowns, find out about the static and dynamic balancing of the rotor that minimizes wear on bearings and couplings, the chrome alloy buckets that resist corrosion and erosion, and the combined trip and throttle valve that can be reset in less than 10 seconds.

A G-E turbine specialist will gladly explain further the benefits of these features. Call him in today. You'll save time and money by following his practical recommendations. General Electric Company, Schenectady, N. Y.

How Waste of Volatile Solvents can be Prevented with "Columbia" Activated Carbon

NOW, more than ever, when conservation is the watchword, solvents vaporized in industrial operations should be recovered for re-use. This can be done efficiently and safely with a "Columbia" Activated Carbon solvent recovery plant, at a cost that is usually less than a cent a pound—a fraction of the cost of new solvent.

What Solvents Can Be Recovered

Practically any one, or any combination, of the low-boiling solvents can be efficiently and economically recovered with "Columbia" Activated Carbon. These include: alcohols, chlorinated compounds, esters, ethers, hydrocarbons, and ketones.

Where Solvents Can Be Recovered

Almost any quantity of solvent vaporized under conditions which permit the vapor-laden air to

be collected from the industrial operation can be recovered with the "Columbia" Activated Carbon system, even though vapor concentration is extremely low and water vapor is present. Industries in which the system can be profitably used include: rayon, rubber, plastics, lacquer coating, linoleum, smokeless powder, rotogravure printing, dry cleaning, and solvent extraction of oils.

Let Us Help You Save Your Solvent Dollars

If you vaporize solvents in your operations, we can help you determine whether you can recover them profitably with "Columbia" Activated Carbon. We can design and supply a complete recovery plant with guaranteed operating characteristics which permit quick amortization of the cost. Write us about your requirements and let us suggest what and where you can save.

Curing the Big Guns' "Sweet Tooth" with "Columbia" Activated Carbon

Great quantities of alcohol are required in the production of smokeless powder for the big guns. Much of that alcohol is made from "high test" cane sugar molasses . . . our largest source of sugar.

To make a gallon of alcohol requires enough molasses to make about thirteen pounds of sugar. Thus every gallon recovered can mean thirteen more pounds of sugar for the needs of the nation.

Each time a 16-inch gun is fired, it eats the equivalent of one-fifth of an acre of sugar cane. A thousand field pieces in an hour's firing can take from American tables as much sugar as would be refined from a field two-thirds of a mile square.

Solvent recovery systems using "Columbia" Activated Carbon will recover for re-use more than 25 per cent of all the alcohol used in smokeless powder production. Millions of gallons will be recovered every month.



The word "Columbia" is a registered trade-mark of Carbide and Carbon Chemicals Corporation.

We supply complete solvent recovery plants with guaranteed operating characteristics.

For information concerning the uses of "Columbia" Activated Carbon, address:

CARBIDE AND CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation



30 East 42nd Street, New York, N. Y.

PRODUCERS OF SYNTHETIC ORGANIC CHEMICALS

Power Dives begin with POWER DRIVES



THE power dive that ends in vengeance for the treachery of Pearl Harbor, begins with power drives which convert horsepower into battle power.

Power drive efficiency begins with bearings — guardians of vital horsepower on every power drive. Dodge Rolling Bearings insure factory-engineered efficiency for your drives. They are completely assembled, factory adjusted, prelubricated, shipped ready to install on the shaft and run at full load. There is no possibility of dirt entering Dodge Bearings as they are sealed both on and off the shaft. Ease of mounting saves precious time, and unit installation protects them from possible damage.

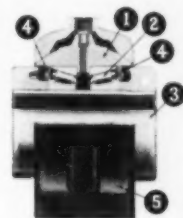
The right bearing for many of to-

day's production jobs is the Dodge-Timken Clamp Sleeve Bearing. It is a general purpose bearing — rugged and dependable — designed for a life expectancy of 30,000 hours of service under conditions for which it is adapted. It is sealed against dust, dirt and lubrication leakage — 50,000,000 revolutions can be expected from one lubrication. Many types and sizes available immediately from local stocks.

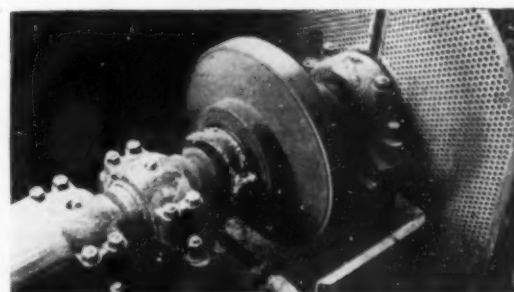
Dodge Distributors specializing in "The Right Drive for Every Job" provide industry with a source of supply from local stocks, including alternate selections. They offer their services in checking performance — assisting in modernization and extending equipment life. You can depend on them for valuable assistance in putting all your power in the job.

DODGE MANUFACTURING CORPORATION
Mishawaka, Indiana, U. S. A.

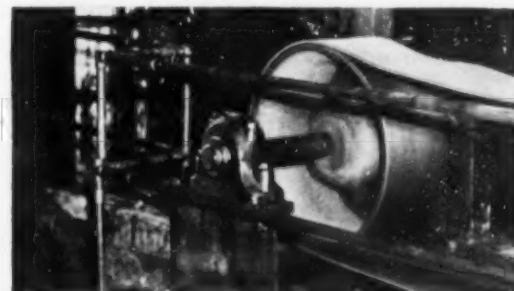
Features of Dodge-Timken Clamp Sleeve Bearings



1. Full ball and socket self alignment guards against wear and power waste — simplifies installation.
2. Timken tapered roller bearings give full radial and thrust load capacity — vital to putting all power in production.
3. Full length sleeve gives larger distribution of load — reduces pressure — saves wear and power — lengthens drive life.
4. Indestructible steel seals guard against lubrication loss and admission of dirt — insure long hours of operation with little maintenance.
5. Rugged, well proportioned outer housing gives over-all protection to bearing.



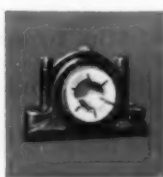
Dodge-Timken Clamp Sleeve Pillow Blocks on Paper Machine Drive. Note also the Dodge Diamond "D" Clutch. This combination of Dodge-Timken bearings and Dodge clutches has been adopted in many mills because of dependable operation and low maintenance.



Dodge-Timken Clamp Sleeve Bearings on Draw Rack Drive in Steel Mill. These bearings are designed for a life expectancy of 30,000 hours and normally require renewal of lubricant every 50,000,000 revolutions.



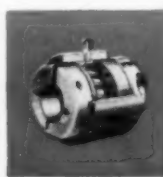
Dodge-Timken
Clamp Sleeve Ball
and Socket Pillow
Block.



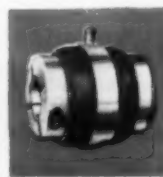
Dodge-Timken
Clamp Sleeve "S1"
Pillow Block.



Dodge-Timken
Clamp Sleeve "D"
Unit Mount.



Dodge-Timken
Clamp Sleeve "B1"
Unit Mount.



Dodge-Timken
Clamp Sleeve "S1"
Unit Mount.

**THROW YOUR SCRAP
INTO THE SCRAP**

**BUY U. S. WAR BONDS
FOR VICTORY!**

DODGE

MISHAWAKA

THE RIGHT DRIVE FOR EVERY JOB

**If you have Air Conditioning or
Refrigerating Equipment that is
not engaged in War Work...**

★ ★ ★ **OFFER IT TO
YOUR COUNTRY NOW!**

We, at York, are turning out for the war effort all the mechanical cooling equipment we can, as fast as we can. *But it is not enough.* It's not enough to furnish American fighters with the ammunition and bombs and motor fuel and rubber and food that they must have... for refrigeration is an essential tool in the manufacture of all these vital war materials, and many more.

We, who for 57 years have urged you to *buy* such equipment, now ask you to *sell* it. York Branch offices throughout the nation are at your disposal to assist in placing your machines where they will make their utmost contribution to Victory. Call the York office nearest you.

York Ice Machinery Corporation,
York, Pennsylvania.



YORK REFRIGERATION AND AIR CONDITIONING FOR WAR

HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885



ANY *Inexperienced* PERSON

Can Operate an Ozalid Whiteprint Machine

MISS ARCHER was hired yesterday . . . and she's already operating the Ozalid Whiteprint Machine at top efficiency . . . making whiteprints of engineering drawings, charts and letters in seconds.

This illustrates how Ozalid DRY DEVELOPMENT has revolutionized printmaking—transforming what was once a tedious job into a simple routine. You merely feed the original and the Ozalid sensitized material into the machine. Two quick steps—*Exposure and Dry Development* . . . and you have positive reproductions which are ready for immediate use in the shop or field.

Compare this simple process with blueprinting which demands the services of more than one trained operator to check water sprays, potash baths, temperature of drying drums, tension of rollers . . . in addition to other wasteful operations which throw print production off stride.

Follow the example of thousands of manufacturers who have been convinced of Ozalid's superiority. Install a compact Ozalid Whiteprint Machine in your drafting room. You'll be sure of a "head start" in war production . . . and savings in labor and materials.

Write for "*Simplified Printmaking*" which completely explains the Ozalid Process.



SIMPLIFIED PRINTMAKING is an illustrated booklet containing valuable "know how" information. It shows how to eliminate unnecessary drafting; make prints with blue, black, maroon or sepia lines on a white background; reduce trimming waste; make "new" originals for subsequent print production.

OZALID PRODUCTS DIVISION

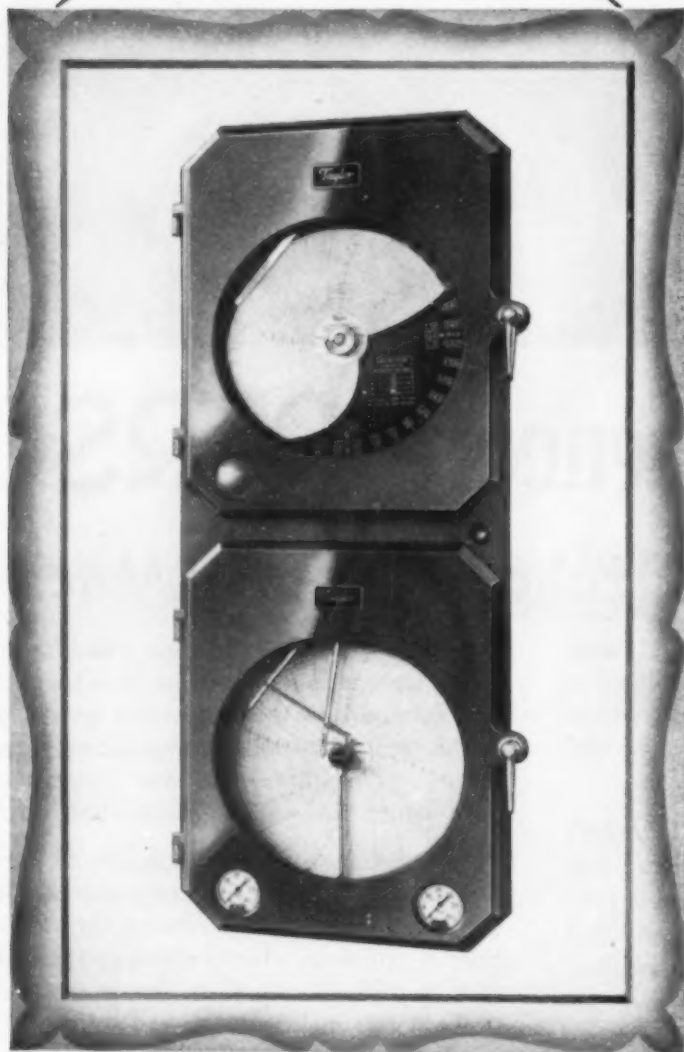
GENERAL ANILINE & FILM CORPORATION

JOHNSON CITY, N. Y.

OZALID IN CANADA-HUGHES OWENS CO. LTD., MONTREAL

WHY AREN'T THERE
ANY PEOPLE
IN THIS PICTURE?

BECAUSE TAYLOR
TIME SCHEDULE
CONTROLLER
ELIMINATES THE
HUMAN ELEMENT!



Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

THIS instrument takes the guess work out of almost any batch process-control problem!

If the distinctive flavor, color, potency, texture, or other physical characteristics of your product are dependent on following an intricate time-temperature or time-pressure schedule, you can't rely on manual control or personal judgment of new operators. But you can rely *absolutely* on the Taylor Fulscope Time Schedule Controller!

Once an ideal schedule has been determined, the cam can be cut to coincide with it precisely, and the same schedule reproduced exactly.

With skilled labor and materials so hard to get, the Taylor Time Schedule Controller is the instrument you need to avoid waste and budget the operator's time most effectively.

PUSH BUTTON CONTROL entirely eliminates manual re-setting of cam at start of cycle.

ADDITION OF INTERRUPTER TIMER permits extreme flexibility of rise, hold, or fall periods in time schedule with the same cam.

DUAL CASE CONSTRUCTION permits easy accessibility to both control mechanism and cam and trip mechanisms.

NUMEROUS AUXILIARY FUNCTIONS can be easily and precisely synchronized with the progress of the processing schedule.

DOUBLE-DUTY form also available for control of two related temperatures, pressures, or flows.

If you haven't already seen this outstanding new Taylor development, get the full story from your Taylor Field Engineer.

Taylor Instruments

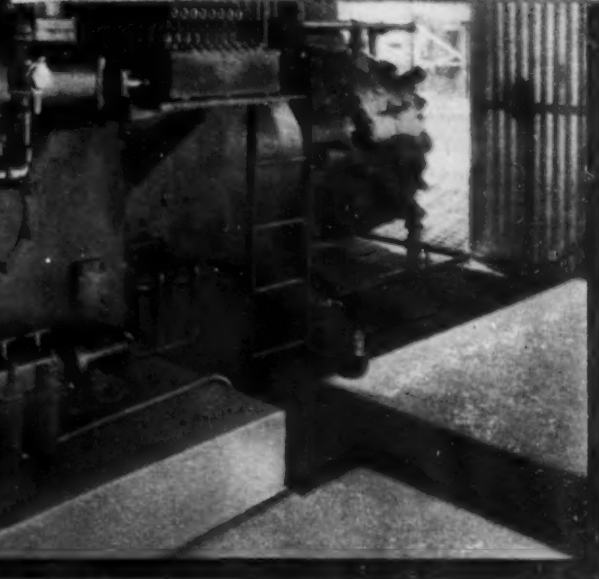
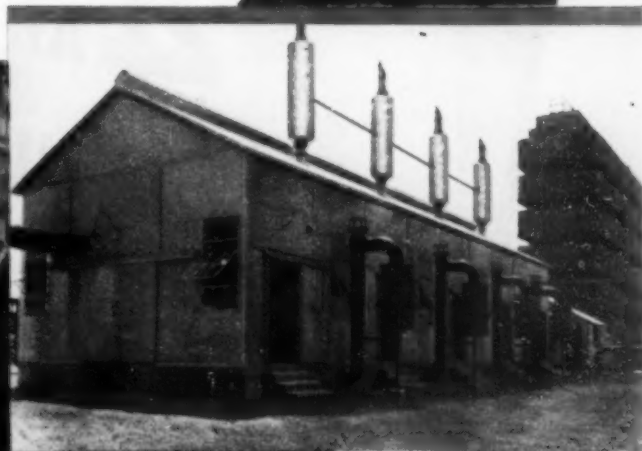
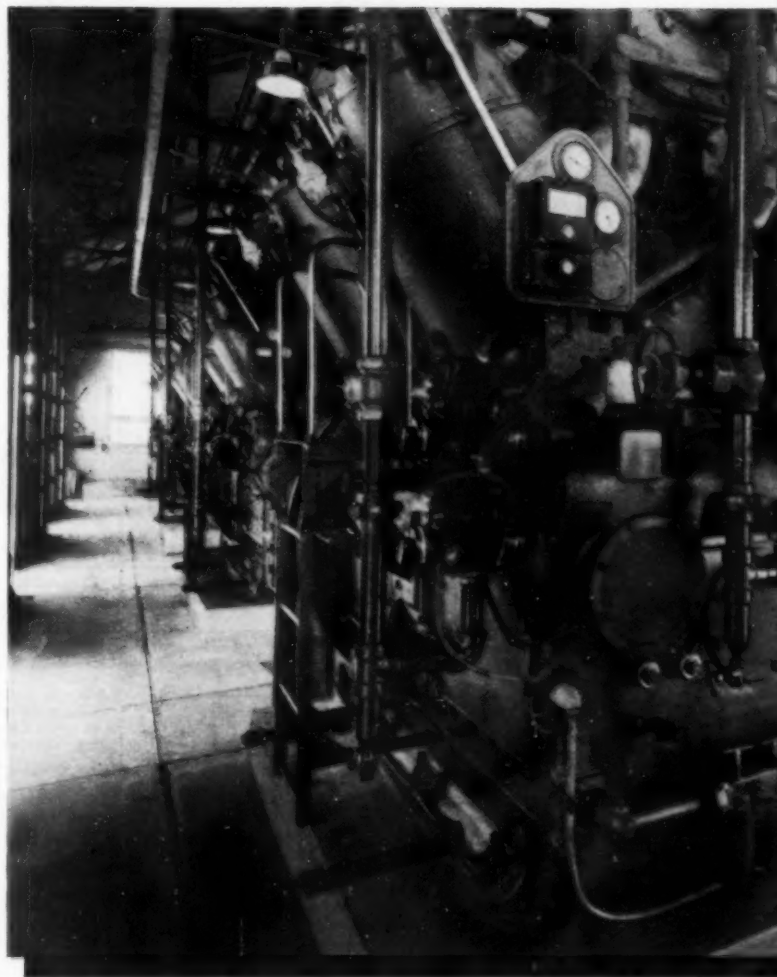
— MEAN —

ACCURACY FIRST

IN HOME AND INDUSTRY

★ KEEP ON BUYING U. S. WAR BONDS AND STAMPS ★

Power for the Eagle With Type G-MV's!



Into vital war synthesis plants go Type G-MV Cooper-Bessemer—in ever increasing numbers. Without delay, they go to work. Month after month, they stay at work—24 hours a day, 7 days a week.

This rugged G-MV had proved itself ideal for the multi-stage compression requirements of synthesis work long before Pearl Harbor. That's why it was ready for America's stepped-up war program—for high

octane gasoline, synthetic rubber, synthetic ammonia, toluol, helium and other gas processing and handling.

Type G-MV compressor has flexibility to meet the widely varying needs of emergency wartime production. It has efficiency to insure maximum results with minimum attention. It has stamina to endure continuous production schedules "for the duration."



THE COOPER-BESSEMER CORPORATION

MOUNT VERNON, OHIO

GROVE CITY, PENNA.

New York

Washington

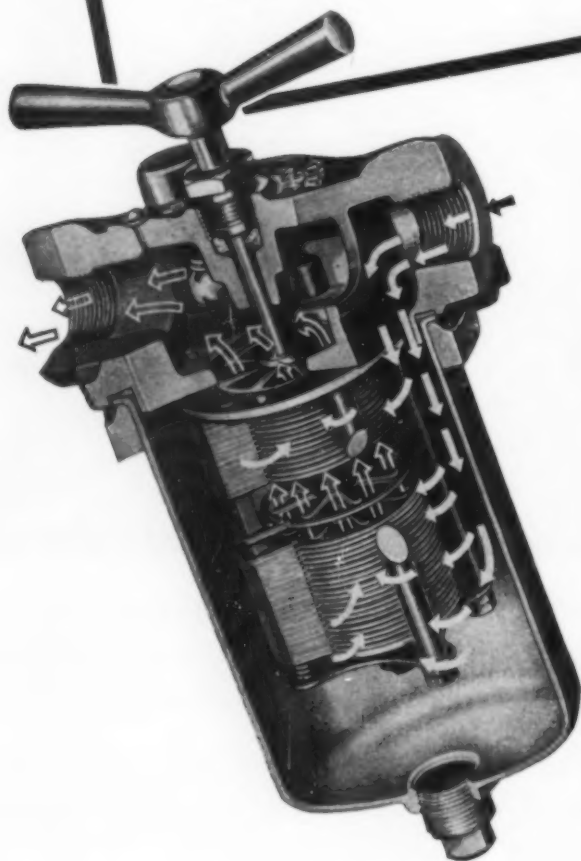
Bradford, Pa.

Parkersburg, W. Va.

Houston Dallas Greerston. Pampa. and Odessa, Texas

4 FLUID CLEANING PROBLEMS 4 ANSWERS ... AND JUST ONE FILTER

On a variety of fluid-cleaning services, Cuno "Filter-Fine" Strainers offer positive removal of solids, low installation cost, minimum maintenance, longest life.



1

| SERVICE | REQUIREMENTS | OTHER BACKWASH FILTERS | CUNO FLO-KLEAN |
|--|-------------------------|-----------------------------------|---|
| Straining 10,560 g.p.m. of process water | Efficiency and low cost | Backwash discharged to atmosphere | No loss of backwash fluid. Substantial savings in pumping costs |

2

| SERVICE | REQUIREMENTS | DUPLEX STRAINERS | CUNO AUTO-KLEAN |
|---|-------------------------------|--|---|
| Straining of rayon spinning dope (700,000 SSU) to remove undesirable solids | Uninterrupted flow | Cleanable without stopping flow | Cleanable without stopping flow |
| | Small space | Double space required | Single compact filter used |
| | Dope cannot be exposed to air | Inoperative half must be opened for cleaning | Unnecessary to open filter for cleaning |

3

| SERVICE | REQUIREMENTS | VIBRATING SCREEN | CUNO AUTO-KLEAN |
|--|--|--------------------------|---|
| Removal of foreign solids from paper coating and break up of pigment particles | Low maintenance cost on severe service | Needs constant attention | Cleans itself continuously. No attention required except for periodic sludge blow-off |

4

| SERVICE | REQUIREMENTS | WIRE-WOUND FILTER* | CUNO AUTO-KLEAN |
|---|-------------------------------|---|---|
| Removal of lumps and dirt from glues and pastes | Complete positive cleaning | Scraper blade fails to clean imbedded solids *Both Cuno wire-wound and competitive make were considered. | Cleaner blades remove not only solids adhering to cartridge surface but also those imbedded in filter medium. (See diagram) |
| | Must remove lint continuously | Not effective against lint | Removes lint continuously |

Here's why you can expect more satisfactory removal of unwanted solids (abrasives, contamination) by specifying

CUNO AUTO-KLEAN FILTERS

1. Cleanable (manually or automatically) without interrupting fluid flow. 2. Non-collapsible, all-metal construction. 3. Minimum pressure drop. 4. Permanent filter element — no cartridge to replace. 5. Obviates duplex installation. 6. Cleaned by *combing*, not scraping. 7. Minimum filter maintenance.

Made of any machinable metal in a wide range of sizes — small compact units up to massive motor-driven models — to handle fluid, air, gas.

HERE'S THE FILTER CONSTRUCTION THAT KEEPS FLUIDS FLOWING



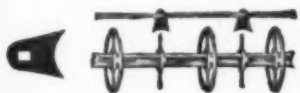
1 This is one of a stack of discs, held apart by



2 Spacers, whose thickness determines the degree of filtration.



3 Discs and spacers are mounted on a central rotatable shaft which has a handle.



4 Mounted on a stationary rod alongside the shaft are cleaner blades, slightly thinner than spacers, extending into the slots between the discs and held apart by cleaner blade spacers.



5 Fluid containing solids passes between discs, and solids larger than the aperture are retained on the outer edges.



6 Turning the handle rotates the discs past the stationary cleaner blades, combing out accumulated solids, which fall into the sump, to be drained when convenient.

50 MORE SERVICES PROTECTED BY CUNO

| | |
|-------------|------------------|
| Acids | Gasoline |
| Adhesives | Glue |
| Air | Grease |
| Alcohol | Gum |
| Alkali | Hydrogenated Oil |
| Ammonia | Ink |
| Animal Oils | Lacquers |
| Asphalt | Latex |
| Banana Pulp | Molasses |
| Beer | Paint |
| Beverages | Palm Oil |
| Casein | Paraffine |
| Castor Oil | Paste |
| Caustic | Pyroxylin |
| Cellulose | Resins |
| Cement | Rubber Cements |
| Chocolate | Sizing |
| Coatings | Soap |
| Coolants | Solvents |
| Dope | Syrups |
| Enamels | Tar |
| Extracts | Tooth Paste |
| Flavors | Vegetable Oils |
| Fuel Oil | Water |
| Gases | Wax |



Tiny models... huge models... described in "Quick Facts". It's free—send coupon.

KEEP FLOW ON "GO" WITH

CUNO

THE "FILTER-FINE" STRAINER

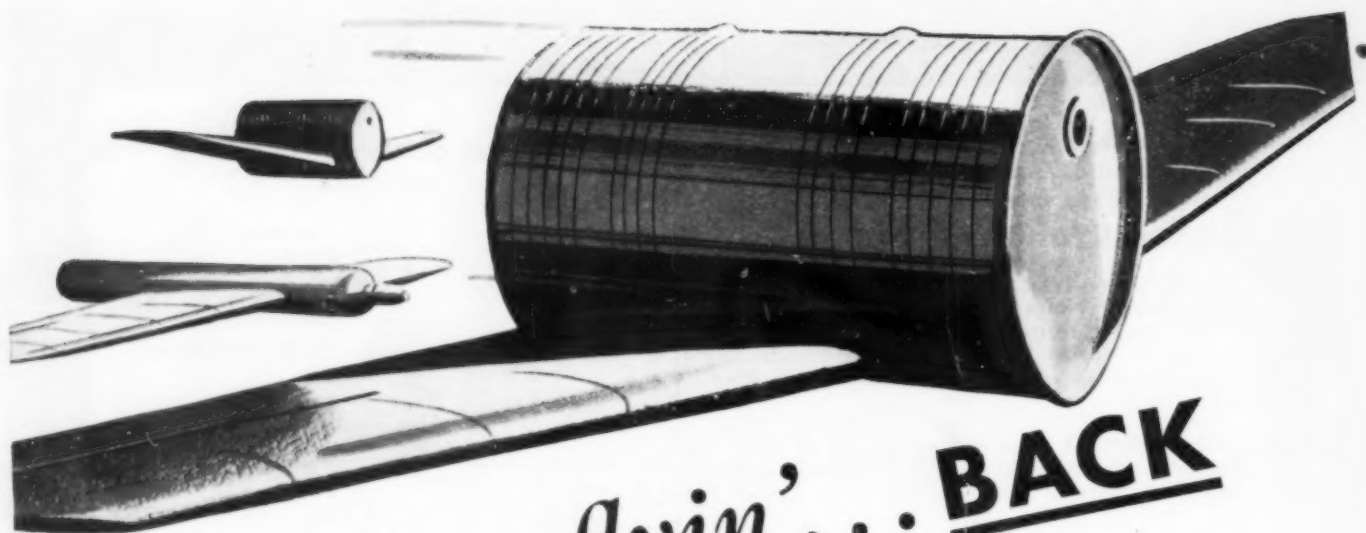
CUNO ENGINEERING CORPORATION
112 South Vine Street
Meriden, Connecticut

Please send free copy of "Quick Facts" to—

NAME

COMPANY

ADDRESS



Keep 'em flyin'... **BACK**

The Army needs chemicals... it gets them.
 The Navy needs chemicals... it gets them.
 High priority warplants need chemicals... they get them.
 Industry needs chemicals... it gets them.

COMES A SHORTAGE OF STEEL CONTAINERS

The Army gets some of its requirements.
 The Navy gets some of its requirements.
 The warplants get some of their requirements.
 Industry gets less...

THINGS SLOW DOWN

★ ★ ★ ★ ★
**RIGHT NOW, DU PONT HAS THE CHEMICALS
 ...BUT CONTAINERS ARE SHORT**

But when the Army empties containers quickly,
 when the Navy empties containers quickly,
 when the warplants empty containers quickly,
 when industry empties containers quickly

**AND ALL USABLE STEEL CYLINDERS, DRUMS,
 CONTAINERS ARE SENT BACK***

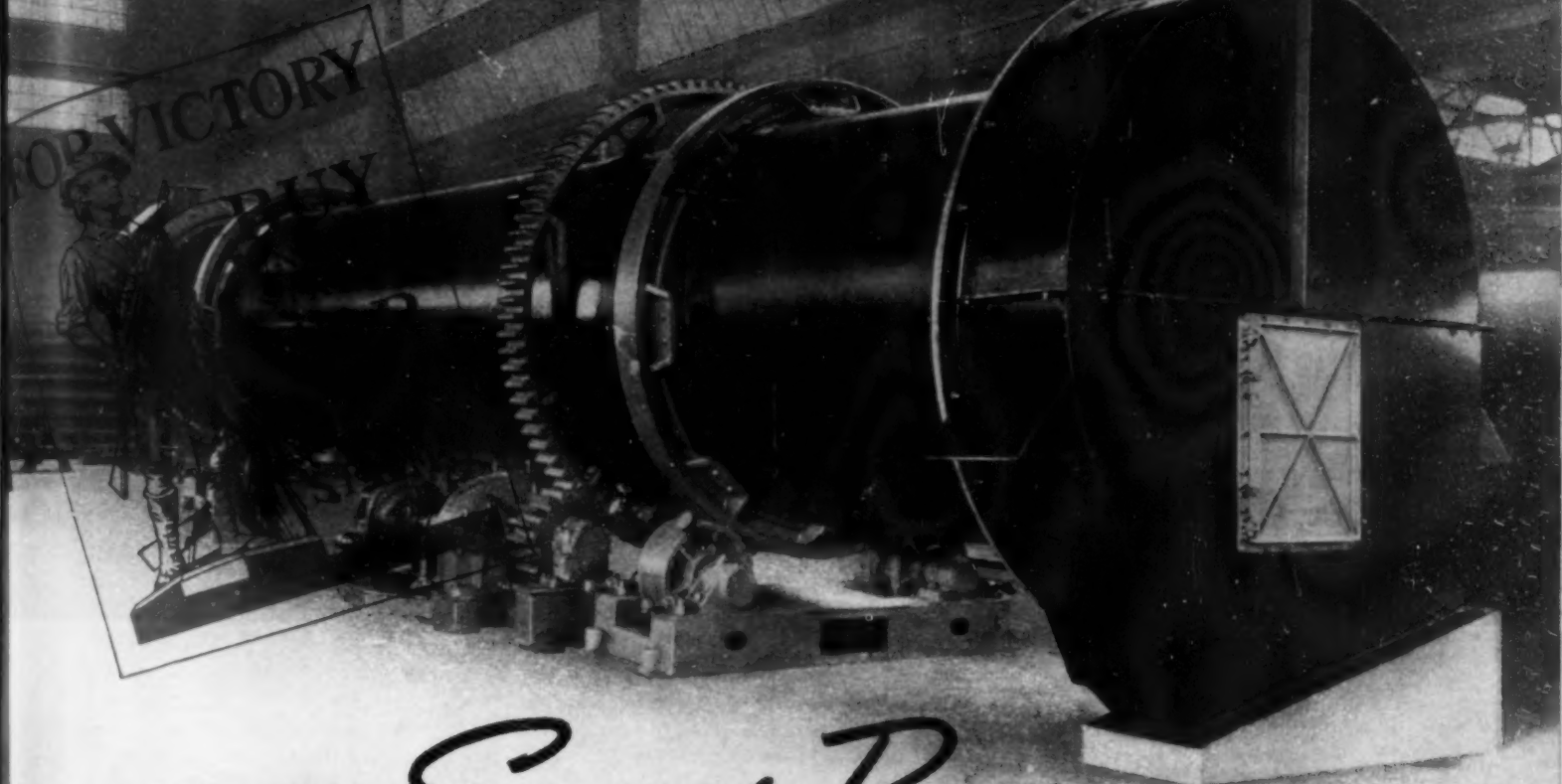
Then the Army gets more.
 Then the Navy gets more.
 Then the warplants get more.
 Then Industry gets more.

**EMPTY CONTAINERS PROMPTLY, SEND THEM
 BACK IMMEDIATELY AND THE SERVICES, THE
 WARPLANTS, GENERAL INDUSTRY CARRY ON**

*We need all Du Pont returnable
 and non-returnable metal con-
 tainers in usable condition.



TECHNICAL APPROACH



is the *Sound Basis* for solving your dryer problems too

• Ten years ago it was an adventure, this matter of dryer design. Recommendations were made almost blindly, based largely on experience with other—but frequently dissimilar materials. Guesswork and luck bulked large—but the Bartlett-Snow heat engineers have changed all this.

Today "Technical Approach" has replaced guesswork—and luck—in Bartlett-Snow design. New formulas, and the new "factors" needed in solving complex drying problems have been developed, tested, proved. The variables—including those of surface evaporation and diffusion, corrosion, abrasion, tendency to cake in cooling, the dust condition, and possible galvanic action are disassembled from each other, studied, checked and the findings verified

when necessary, by running samples of the material through an ingeniously arranged test dryer, so that full allowance for all the conditions can be made in the equipment to be built.

The advantage of Bartlett-Snow's highly technical and highly accurate solution of dryer problems is reflected only in Bartlett-Snow equipment. It's your assurance that the size and type, method of firing, pitch, rate of feed and all other specifications of the equipment recommended by these experts, will be exactly suited to the problem to be met. What is your heat engineering problem?

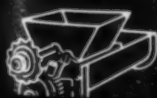
THE C. O. BARTLETT & SNOW COMPANY
6207 HARVARD AVENUE, CLEVELAND, OHIO
30 Church St., New York—First Nat'l Bank Bldg., Chicago

BARTLETT-SNOW

DRYERS • CALCINERS • COOLERS • KILNS

Also complete materials handling facilities to meet any requirement
One contract • One guarantee of satisfactory performance • Unit responsibility

Screw Feeders



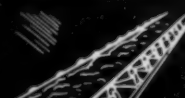
Rotary Crushers



Bucket Elevators



Belt Conveyors



Dust Collectors

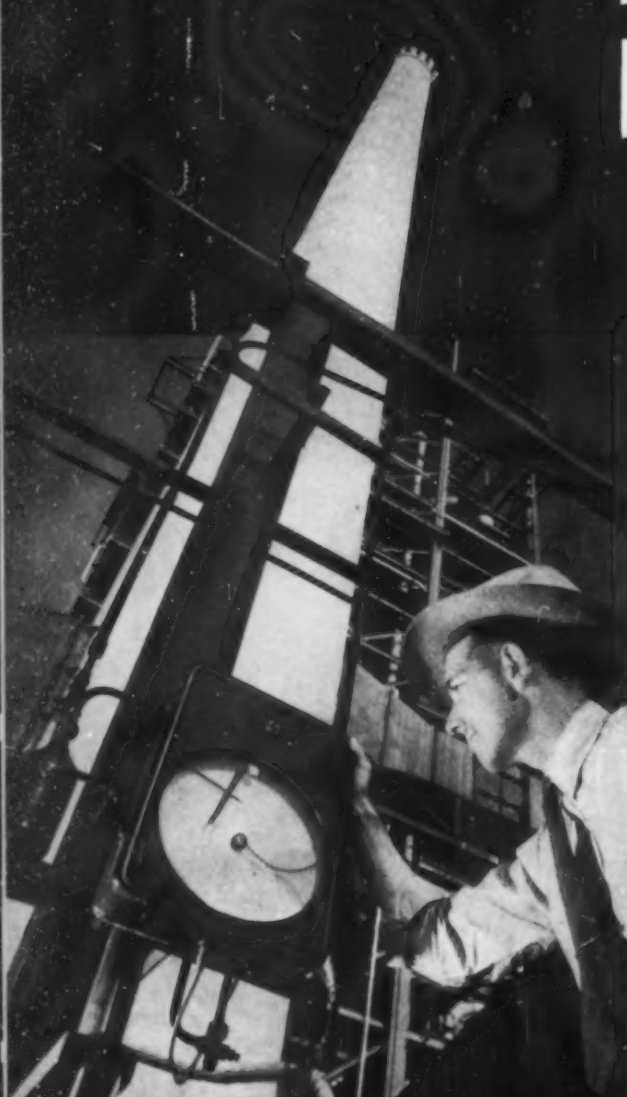


Pressure Vessels



CONTROLS

in the forefront of the Petro-Chemical picture



PETROLEUM'S war winning products... aviation gasoline, toluol, solvents, and butadiene, for example...are of themselves a tribute to the enterprise of America's alert refinery industries.

Precision of control...which includes exact measurement of quantity and flow...is indispensable throughout the operations.

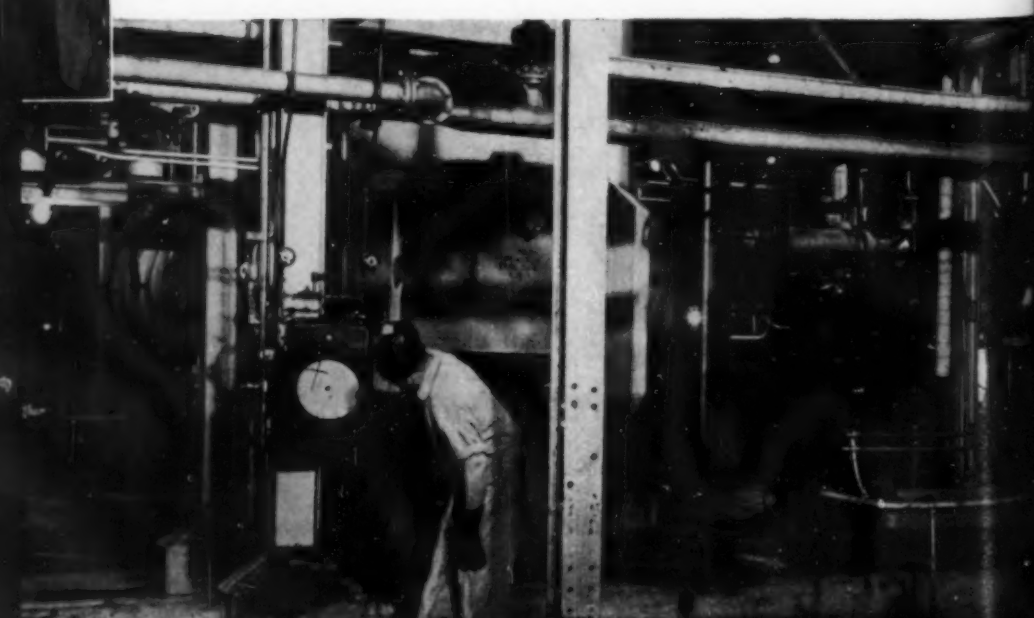
Tracing the processes, you find meters indicated at even the very beginning of the flow sheet...time-tested instruments such as the **METRIC-AMERICAN** orifice meters here pictured.

You meet them in the refinery, where is produced the alkylate base stock which must comprise a high per cent of

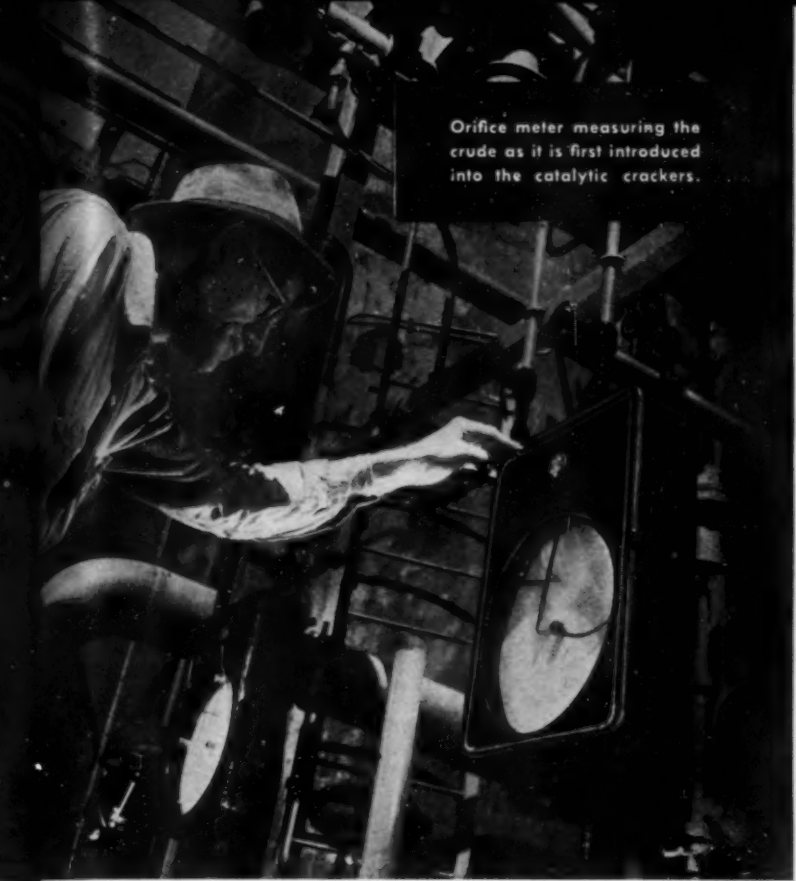
the finished 100-octane gasoline...or where the catalytic cracking processes are making the aviation gasoline and yielding by-products such as toluene for T.N.T. manufacture.

You see them again on the job of measuring high pressure gas...in natural gas cycling plants, where by-product butadiene and butenes are obtained as ingredients for Buna S and Butyl rubbers.


In short...sustained high accuracy is a basic requirement for meters in petrochemical operations. Ruggedness and easy maintenance likewise are essential qualities. **METRIC-AMERICAN** meters, flowmeters, and remote control equipment are strong in these inherent virtues.



In the alkylation plant... refinery of a subsidiary of a large oil company.



Orifice meter measuring the crude as it is first introduced into the catalytic crackers.



Outside the compressor house for the catalytic cracker.



METRIC-AMERICAN orifice meters—
with catalytic cracker in background.



AMERICAN METER COMPANY

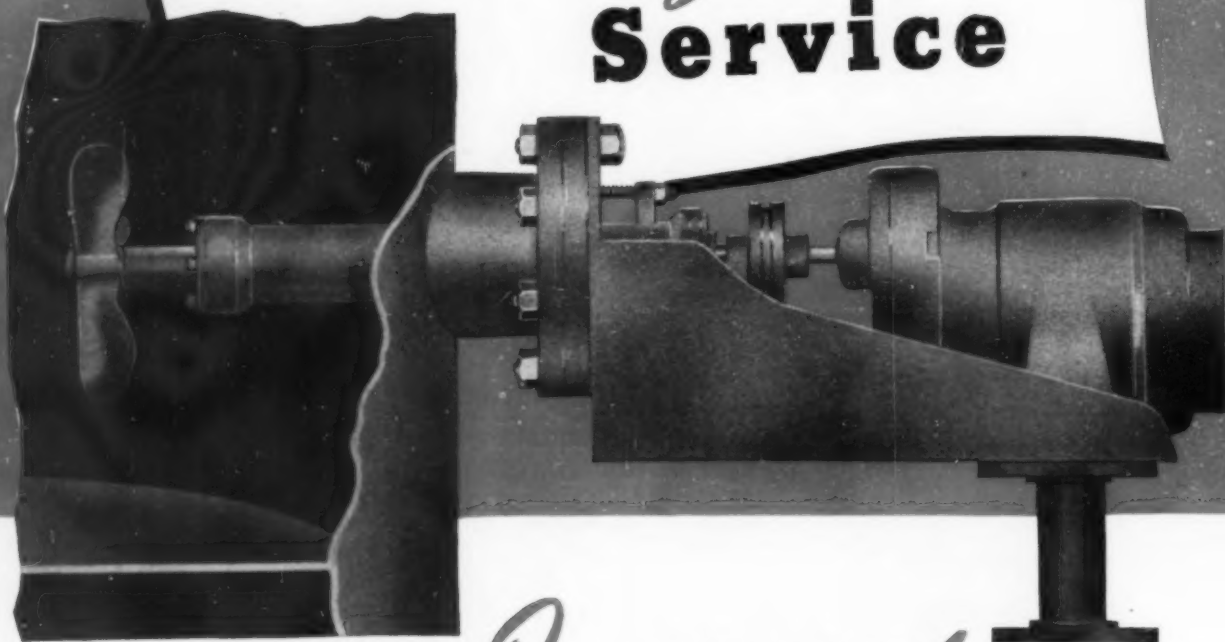
INCORPORATED (ESTABLISHED 1836)

Albany • Baltimore • Birmingham • Boston • Chicago
Dallas • Erie • Houston • Kansas City • Los Angeles
New York • Philadelphia • Pittsburgh • San Francisco • Tulsa

Built For

Longer

Service



the new *Improved*
PORTER Side Entering Agitator



The new improved Porter side-entering agitator is constructed to give thorough agitation and long service. Construction is simplified as far as possible to eliminate wearing parts and at the same time produce a substantial unit that will seal the vessel and provide the desired degree of agitation.

In order to resist action by corrosive liquids the parts operating inside the agitated vessel can be supplied in any metal or alloy.

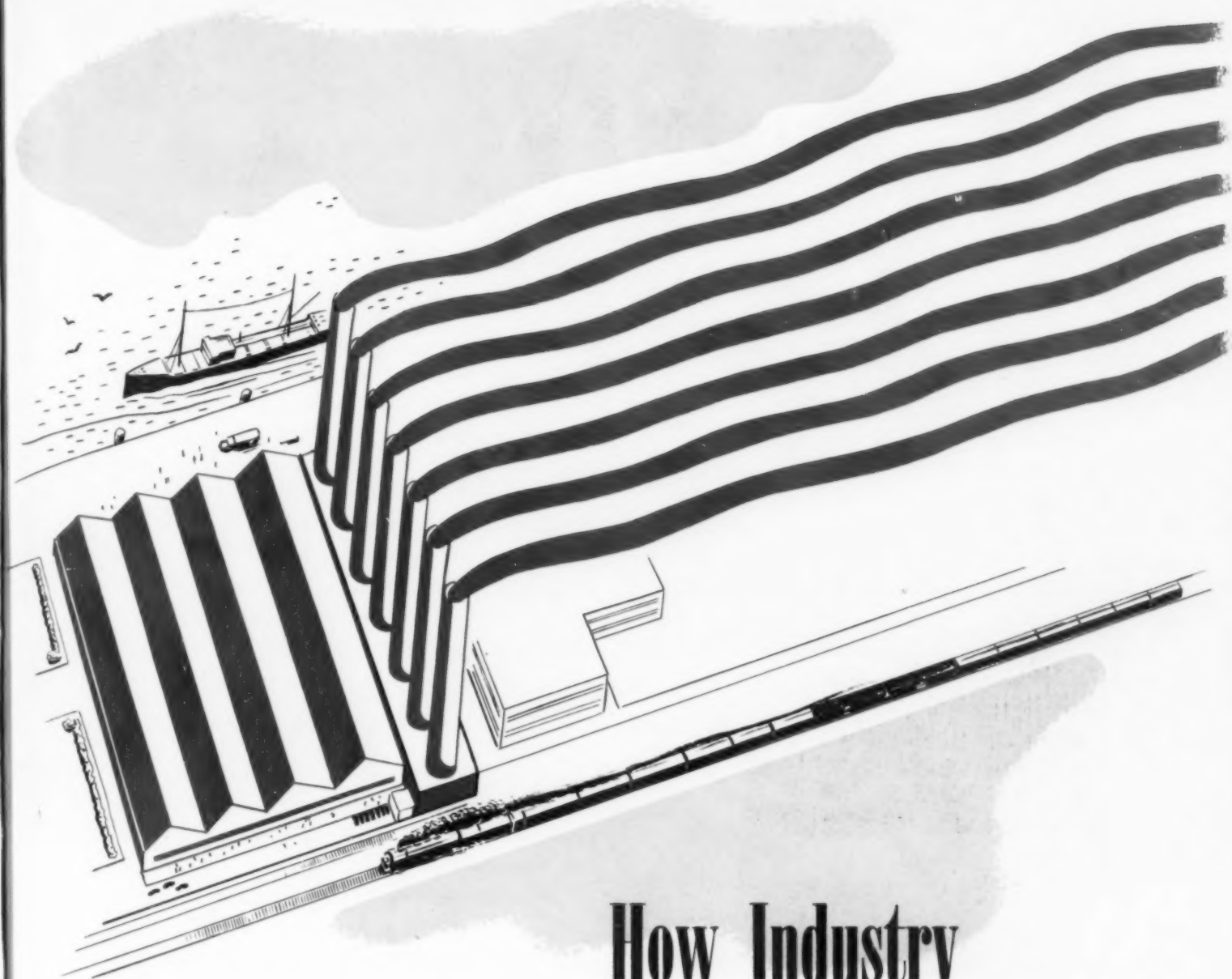
The Porter side-entering agitator is particularly applicable in vessels where vertical agitation is either undesirable or impractical. Standard units can be furnished to employ either belt or motor drive in sizes ranging upward from $\frac{1}{2}$ H.P.

Write for Bulletin SE-100 which gives complete details about this Porter Side Entering Agitator.

H. K. PORTER COMPANY, INC.

PITTSBURGH

PENNSYLVANIA



How Industry Meets the Challenge of Wartime Shortages

When industry was deprived of important raw materials, American ingenuity quickly overcame many of the shortages.

Increased cooperation and pooling of information showed that unaccustomed materials could take the place of products that are restricted or unobtainable.

In processes where they were never before used, Hercules chemicals are now successfully employed. New Hercules chemicals have been developed especially to meet situations caused by war. Some of these are available for wide general use. Others are restricted to important military needs.

Read about a few of these Hercules materials on the three following pages. Consult with us about possible applications in your formulations.

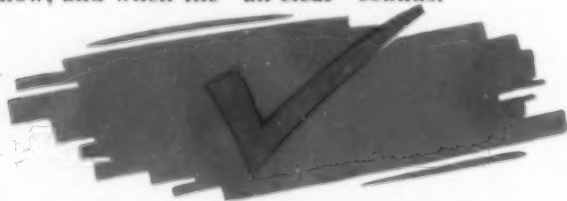




CELLULOSE PLASTICS MEET NEW DEMANDS

Under pressure of wartime demands, cellulose plastics have been developed for wider use. They are meeting new specifications for resistance to heat and cold, dimensional stability, and water absorption—without sacrificing their recognized superiority in toughness and adaptability to mass production on the fastest automatic machines.

The fact that both *combatant* and *civilian* types of gas masks now in production are made with valves, lenses, diaphragms and Y-tubes of *cellulose acetate* plastic may be significant in the manufacture of your product—now, and when the "all clear" sounds.



FOR FAST, HARD-DRYING VARNISHES WITH LINSEED OIL

Pentalyn* M, Hercules' newest resin of the rosin-pentaerythritol series, is designed especially to develop fast through-dry with linseed oil.

Varnish makers who are working on high-priority orders, and are faced with the necessity for producing fast-drying, hard, durable varnishes from linseed and the other "soft" oils—on extra-rapid cooking schedules—are finding that Pentalyn M is the answer to their needs.

Many varnish formulators have taken this new resin into their laboratories and, utilizing the outstanding combination of properties which it offers, have worked out important additions to their lines, for use now in strategic coatings and in commercial work as soon as conditions will permit.

*Reg. U. S. Pat. Off., by Hercules Powder Company



ROSIN'S
GOOD QUALITIES . . .

PLUS

Poly-pale* Resin has a melting point of 100° C., 15 to 20° C. higher than natural rosins. It is substantially free from metals. Dissolved in solvents or drying oils, it shows no tendency to crystallize. These valuable qualities are also imparted to derivatives of Poly-pale Resin, such as synthetic resins and resinates.

Other advantages over rosin are: wider and more complete solubility, lower acid number, higher viscosity in solution. It is available in two color grades, N and W G.

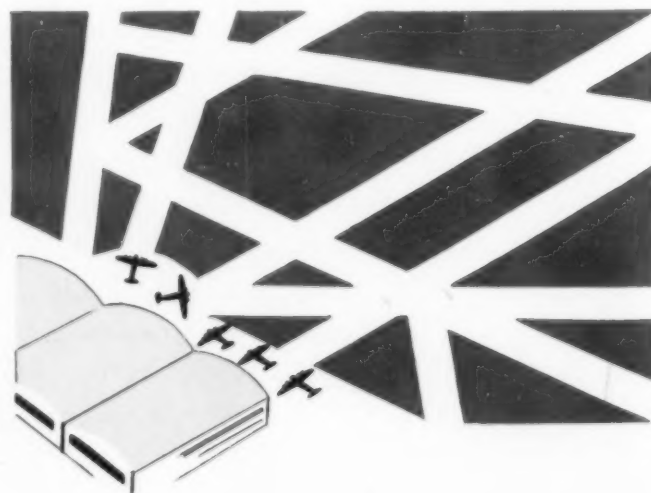
Poly-pale replaces rosins advantageously, and also offers values that are unobtainable with regular rosins.

KEEPS CONCRETE SMOOTH

Every winter, freezing, thawing, and de-icing agents cause serious scaling on highways and airport runways. It is especially important that aprons and runways on our many new airports be kept smooth.

Vinsol*-treated cement makes concrete that resists scaling. Concrete made with this cement is quicker, easier, and cheaper to place, because it is more plastic, smoother to work, and less subject to bleeding and segregation of the aggregates. Thus Vinsol-treated cement is profitably used in the South as well as the North.

Leading cement companies are now in a position to supply Vinsol-treated cements on specification.

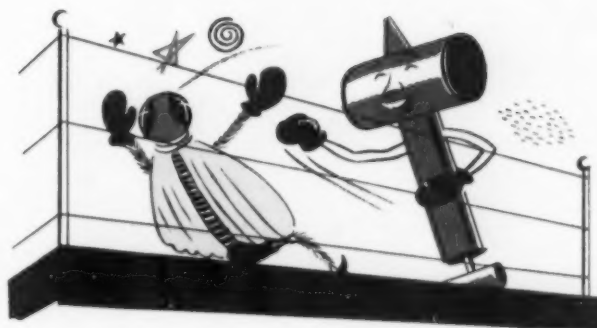


CONTROL OF INSECT PESTS WITH DOMESTIC MATERIALS

When lack of ships reduced supplies of pyrethrum, Thanite* was ready to take its place. It proved to be a more powerful toxic agent in household sprays, and is also effective in heavy base oils for cattle sprays. A 2% solution of this new ingredient kills more flies than a 5% solution of standard pyrethrum extract.

To Conserve Pyrethrum and Rotenone

DHS Activator* is helping to make existing stocks of pyrethrum and rotenone produce



more fly sprays and agricultural dusts. It extends by increasing the effectiveness of other toxic agents. It has proved so valuable in the war emergency that it is being specified in sprays for Army and Navy use.

YARMOR FOR CATTLE SPRAYS

Cattle sprays properly formulated with Yarmor* Pine Oil provide the maximum of knockdown, kill, and repellency. Yarmor is also a valuable ingredient in general disinfectants, cleaners, and scrubbing soaps.

Thus Thanite, DHS Activator, and Yarmor are serving public health and agriculture, helping to avert what might otherwise be a dangerous situation if we had to rely upon foreign sources only for toxic materials.

HERCOLYN* REPLACES SCARCE PLASTICIZERS

To extend the allotted quantities of the now-scarce plasticizers such as castor oil (raw or blown), dibutyl phthalate, tricresyl phosphate, and so forth—as well as to replace them entirely for uses to which they may not be allocated—industrial America is turning to Hercolyn.

This high-boiling liquid resin—the hydrogenated methyl ester of pale wood rosin—has been used for years by manufacturers of lacquers and coated in-

dustrial fabrics when they wanted good "build" or body, high gloss, maximum alkali resistance, or greatest development of pigment color in the film.

Hercolyn can be intelligently applied as an extender in the more critical uses, or as a complete replacement where the final degree of service life is not demanded. Some of these new uses will last, frankly, only for the duration. Others will prove so acceptable as to remain even when current shortages have disappeared.

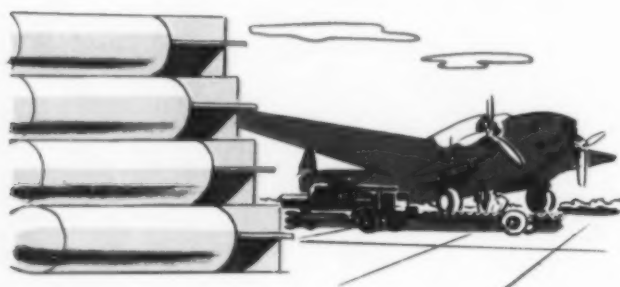
*Reg. U. S. Pat. Off., by Hercules Powder Company

TOUGH AT 70° BELOW ZERO!

Numerous products essential in prosecuting the war are readily formulated with Hercules Ethyl Cellulose. These include molded knobs, steering wheels, fittings, and handles; extruded tubes, strips, tapes, and insulation for wire; coatings for fabrics used in gas masks, raincoats, stratosphere suits, and decontamination bags.

Toughness and adequate flexibility are maintained at the maximum low temperatures specified by the Army and Navy—minus 70° F.

Write for technical data and the names of fabricators who are formulating plastics with Hercules Ethyl Cellulose and other Hercules Cellulose Derivatives.



NITROCELLULOSE LACQUERS NEEDED FOR WAR PRODUCTION

Every day sees new opportunities develop for nitrocellulose lacquer. Because of its quick-drying properties,

it speeds war production of tanks, bombs, planes, and other products having first call on priorities.

The demand for nitrocellulose lacquer in direct war effort is steadily increasing—because it provides a quick-drying, durable finish, easily applied to metal, wood, or plastic surfaces.

With nitrocellulose available to lacquer manufacturers for these purposes, the opportunity to develop priority business is one no manufacturer should overlook.

MAKE SOLVENTS TO YOUR OWN SPECIFICATION



First decide what properties you want most in a solvent. Then, by selecting and blending Hercules Terpene Solvents you can vary solvent strength, volatility, flash point, odor, stability, drying time, and other characteristics. You can further modify and extend with mineral thinners and other solvents.

The possibilities for producing valuable characteristics by such combinations are practically limitless. A new booklet, "Hercules Terpene Solvents," describes the five types of these solvents, and contains a stimulating introduction to methods and results of blending based on work done in the Hercules laboratories. Mail the coupon for your copy.

*Reg. U. S. Pat. Off., by Hercules Powder Company

HERCULES POWDER COMPANY
INCORPORATED
922A Delaware Trust Building, Wilmington, Delaware

Please send me further information on:

Name _____ Title _____
Company _____
Address _____ State _____
City _____

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CELLULOSE PRODUCTS • NAVAL STORES • CHEMICAL COTTON
EXPLOSIVES • PAPERMAKERS CHEMICALS

HERCULES POWDER COMPANY

WILMINGTON • DELAWARE

NOW LISTED UP TO 600 hp

BY UNDERWRITERS' LABORATORIES, INC.

G-E Explosion-proof Motors for Use in Hazardous Gas (Class I, Group D) Locations



or still larger capacities...
G-E INERT-GAS-FILLED MOTORS

In large motor sizes the use of surface-cooled, gas-filled motors for Class I, Group D, conditions may be desirable. These motors—another G-E development—provide the refinery operator with a complete arrangement for maintaining a noninflammable atmosphere slightly above atmospheric pressure within the motor. They can be furnished in various electrical types, in sizes as low as 100 hp and up to the limits of single-motor drive.

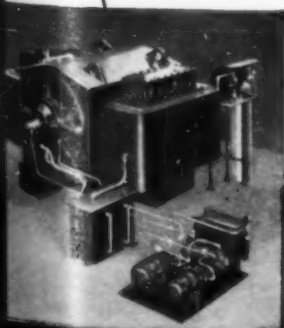
The General Electric family of motors for hazardous service includes types for every need in a wide range of sizes.

Our engineering staff can help you pick the right motor and control, and advise on the use of over-load relays and other installation details for full-scale protection and maximum production.

Another G-E "First" in Motors for Hazardous Places

NOW you can buy a *big* induction motor of the totally enclosed, fan-cooled type that's listed as explosion-proof for Class I, Group D, locations on the basis of extensive tests by Underwriters' Laboratories, Inc. The size range of these General Electric motors goes up to 600 hp, 3600 rpm; voltages go up to 4000.

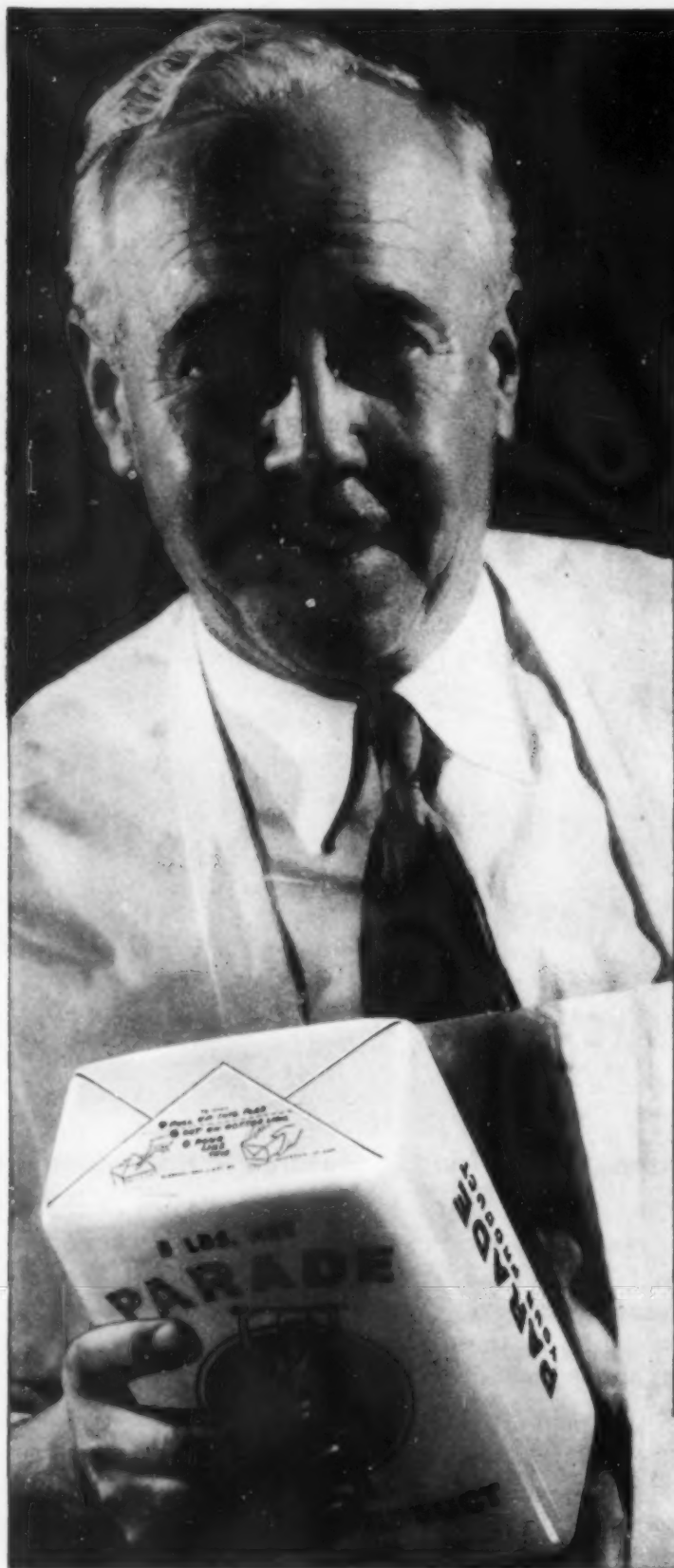
In addition to the explosion-proof features of this motor design, it offers unusual protection against electrical or mechanical failure in highly unfavorable surroundings. Actual service experience in refineries and chemical plants confirms the corrosion resistance, the easy lubrication, and maintenance advantages of this long-lived motor. For complete details, call or write your local G-E office. *General Electric, Schenectady, N. Y.*



The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees at its plants manufacturing good equipment.

Builder of **TRI CLAD** Motors

GENERAL ELECTRIC



A Grocer Backs the Products that Push Themselves

Ask a grocer why he pushes products packaged in Bemis Deltaseal Bags and chances are he'll say it pays to back a product packaged to sell itself.

And products in Deltaseal Bags do push themselves. The attractive Bemis printing catches the shopper's eye... asks her to buy. The handy pouring spout makes it easy for her to pour and measure the contents... makes her a repeat customer.



BEMIS BRO. BAG CO.

Headquarters for the

DELTASEAL System of PACKAGING

Minneapolis, Minnesota

OFFICES: Baltimore • Boston • Brooklyn • Buffalo
Charlotte • Chicago • Denver • Detroit • E. Pepperell
Houston • Indianapolis • Kansas City • Los Angeles



Louisville • Memphis • New Orleans • New York City
Norfolk • Oklahoma City • Omaha • Peoria • St. Louis
Salina • Salt Lake City • San Francisco • Seattle • Wichita

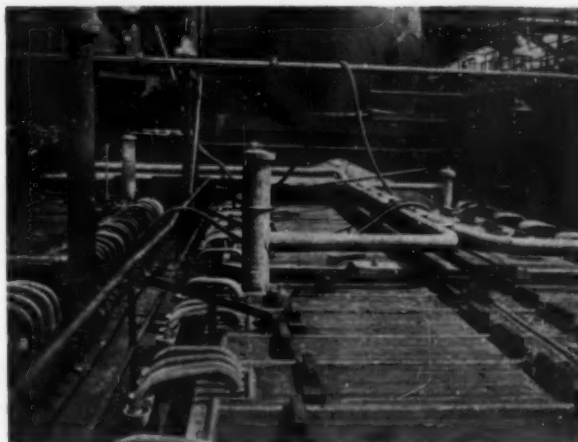
LEAD

Yes-you can use

● to replace **RUBBER** —if it is **KELLEY HOMOGENEOUS BONDED**

You may be surprised to find how well Lead can be used in chemical and process equipment when Rubber wears out. It depends on the Bond. When Lead is *Kelley Homogeneous Bonded* it will Hold . . . under vacuum, high steam pressure, twisting, vibration, shock, and drastic changes in temperature and pressure. Kelley Homogeneous Bonded Lead is now replacing Rubber in many processing plants engaged in war work.

This work may be done at our plant or in the field. We have the necessary men available. Write, wire or phone us for information.



● *Loose Sheet Lead Installations*

We are able to handle your sheet lead installations, replace worn out Tanks and Equipment. This work done at your plant or ours. Large Tanks and Vessels may be shipped direct to any of our sidings.

O. G. Kelley & Company

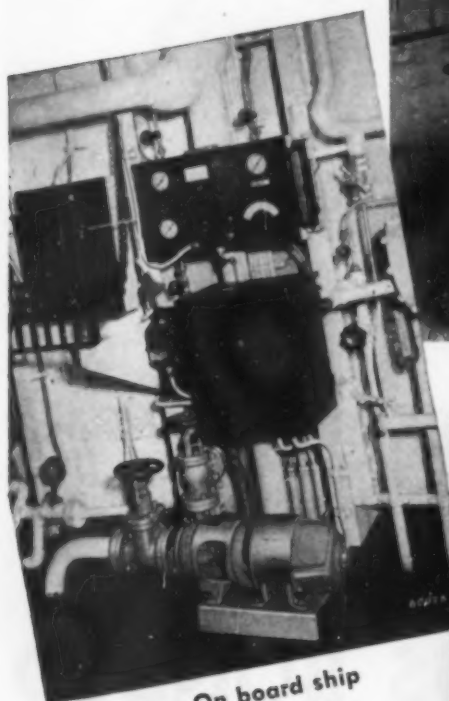
103 PARK AVENUE, NEW YORK



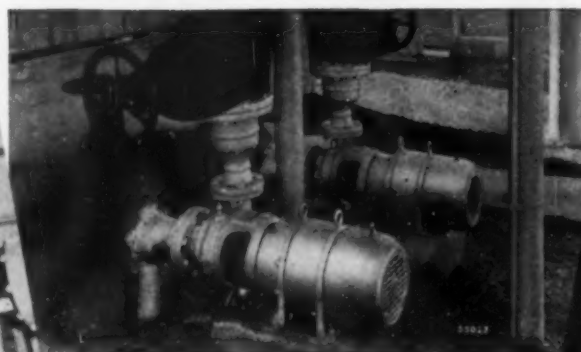
JOHNSON CITY, TENNESSEE

(DORCHESTER STATION)
Boston, Mass.

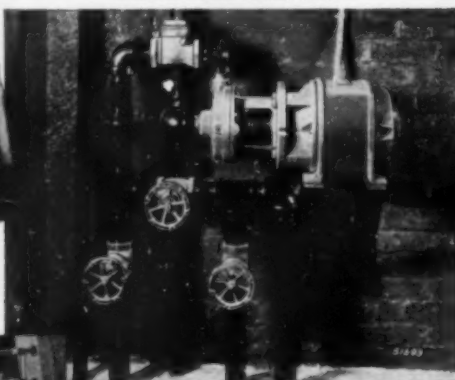
You Can Put The MOTORPUMP Anywhere



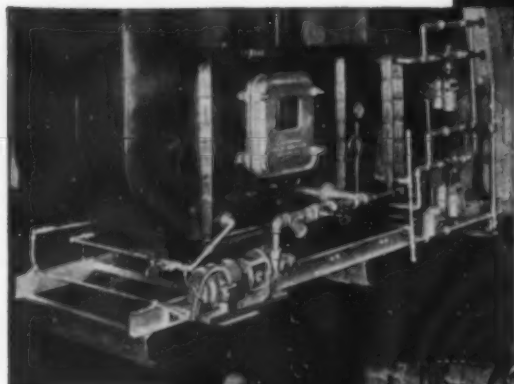
On board ship



Above: Out-of-doors
Below: On brackets



On a truck



On other machines

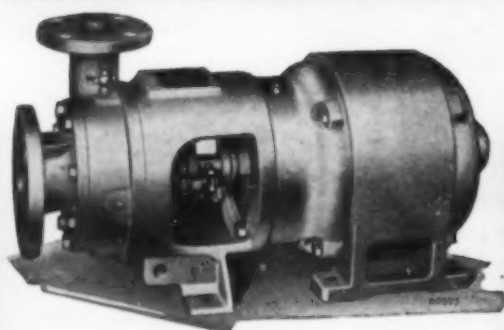
Vertical
— on a wall



The Motorpump is a versatile pumping unit. Its compact, rigid construction permits its installation most anywhere.

Furthermore the Motorpump is highly efficient, thereby keeping power costs at a minimum. High quality construction such as an oversize shaft and bearings assures dependable operation and minimum maintenance.

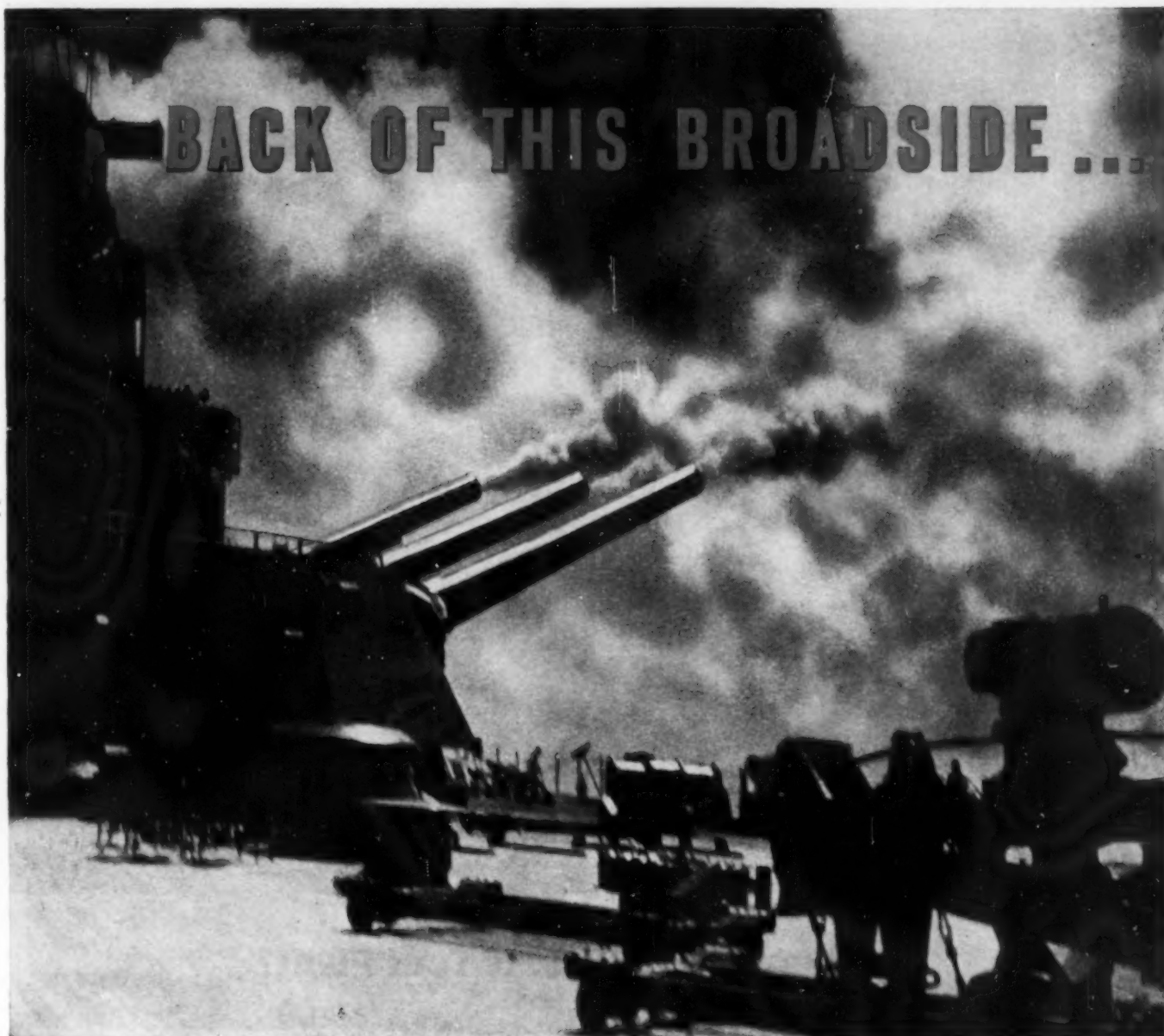
A complete range of sizes makes possible a selection exactly suited to your requirements. Capacities range from 5 to 1800 gal per min against heads up to 500 ft. Ask the Ingersoll-Rand engineer for a copy of bulletin No. 7864. He will gladly give you detailed recommendations for a particular job.



Ingersoll-Rand

Cameron Pump Division
11 Broadway, New York, N. Y.

9.165



are Texaco Lubricants

HURLING ten tons of destruction twenty miles over the horizon, broadside firing puts punishing shock loads on every battleship mechanism. From gun turret to geared turbine propulsion machinery, lubricants must be rugged . . . withstand heat, cold, high speeds, heavy loads . . . maintain continuous precision performance.

In your war plant, too, you depend heavily on lubricants for high speed, uninterrupted production. And when you depend on Texaco, you are assured

of the same high performance enjoyed by the U. S. Navy, Coast Guard, Maritime Commission, etc. . . . and by the many fields listed in the panel.

Trained Texaco Lubrication Engineers will gladly cooperate in increasing throughput in your plant . . . in decreasing down-time for repairs and replacements. Phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

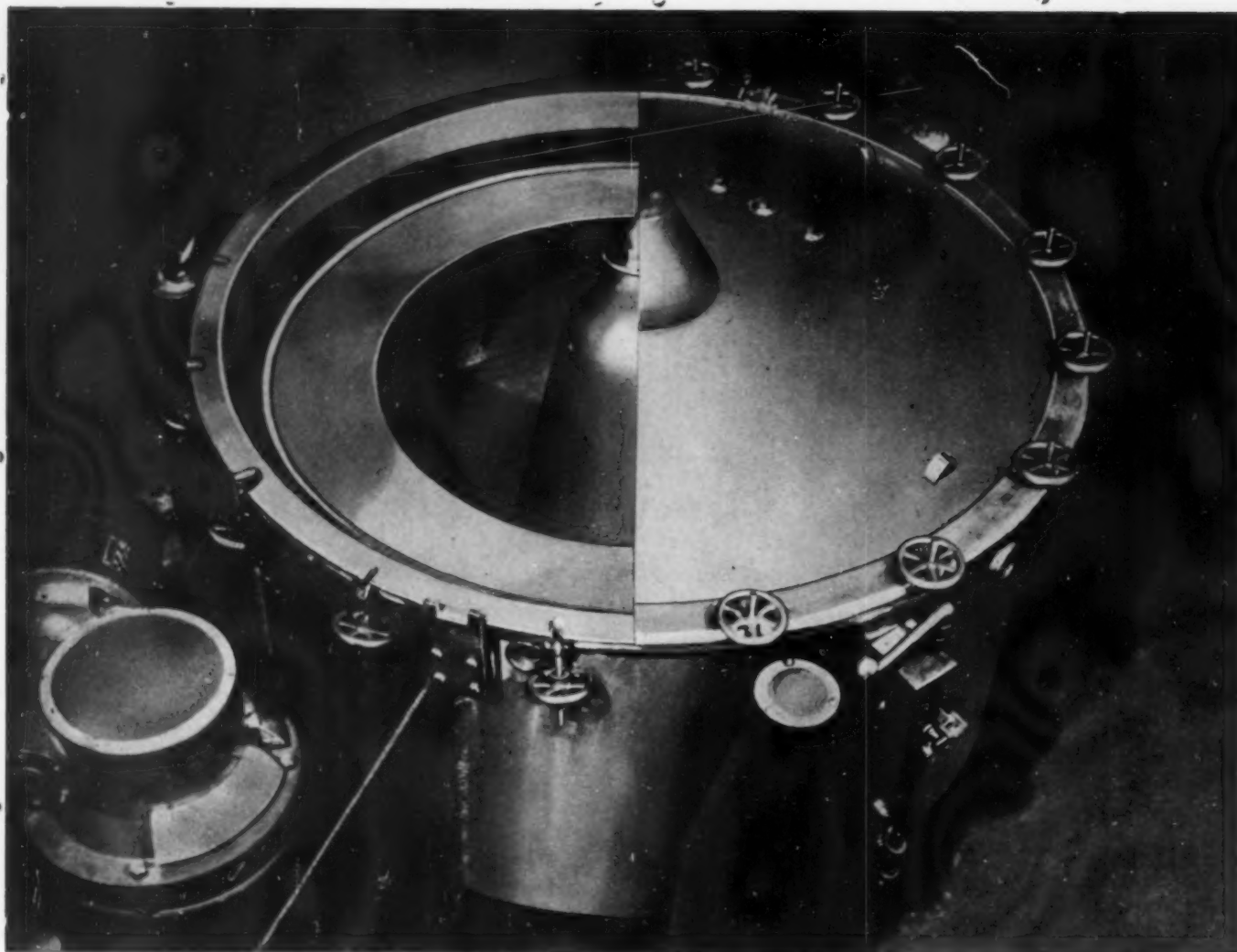
THEY PREFER TEXACO

- ★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.
- ★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.
- ★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.
- ★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.
- ★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.



TEXACO Lubricants and Fuels FOR ALL INDUSTRIES

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY



How Many Years B. C. Is Your Plant?

If your plant is still "B. C." — *Before Centrifugals* — this may be a good time to plan on an "A. C." future. A future of increased production, lower costs, more profitable operations . . . perhaps a wider market . . . with the help of A T & M.

For many plants, "B. C." meant slow, space-consuming equipment in extracting, precipitating, dehydrating, impregnating and coating processes—kiers, autoclaves, tanks, filters, drying machinery.

For those plants, centrifugals engineered by A T & M have often doubled production, cut floor space requirements in half, combined a delicate or otherwise impossible series of operations in one swift, space-saving machine.

No Improvement Since Aristotle! . . . A T & M Solved This Separation Problem

No improved method of extracting oil

from the rind of a fruit had been discovered since ancient times . . . until A T & M engineers went to work on this customer's problem. Proper speed and cycle were quickly found, but, in the necessarily imperforate basket, the oil could not be completely extracted until A T & M devised an ingenious method of adding water at the end of the centrifuging cycle. Final results: more oil in less time from one quick, smooth, continuous operation.

But, in addition to difficult engineering applications, standard A T & M centrifugals in all machineable metals and coatings . . . link suspended, suspended or base-bearing . . . are in service throughout the process industries, and are available to you as national needs permit. A T & M engineers, with due regard to present emergency conditions, will con-

sult with you without cost or obligation. Address American Tool & Machine Co., 1415 Hyde Park Avenue, or 30A Church St., New York, N. Y.

VICTORY FIRST . . .

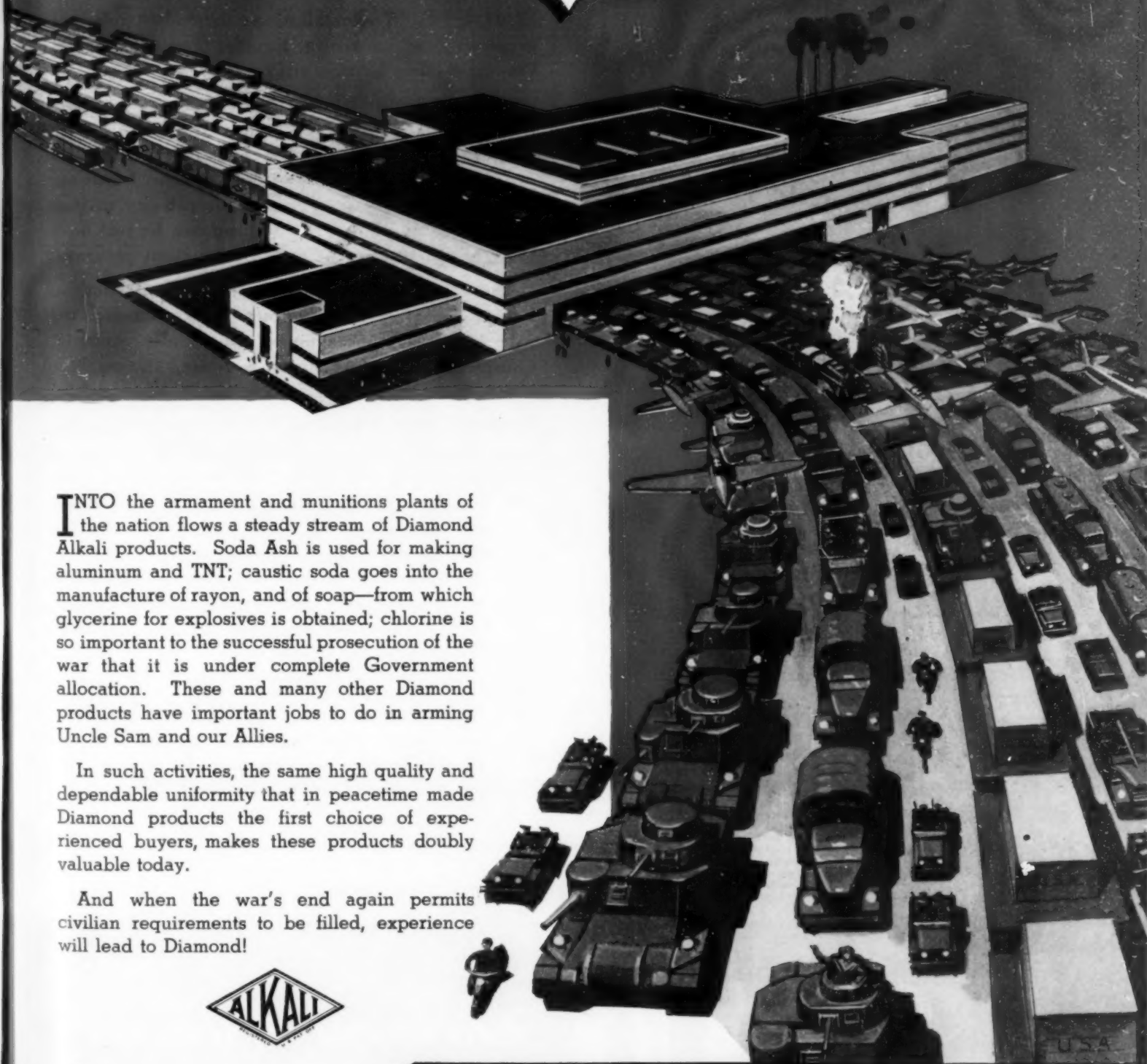
But A T & M can also help you win the peace. Plan now on the big savings centrifuging can provide in all operations involving:

| | |
|--------------------|----------------------|
| Extraction | Precipitation |
| Dehydration | Impregnation |
| Filtration | Coating |

A T and M

A T & M CENTRIFUGALS SAVE TIME AND SPACE

Vital Supplies **FOR THE ARSENAL OF VICTORY**



INTO the armament and munitions plants of the nation flows a steady stream of Diamond Alkali products. Soda Ash is used for making aluminum and TNT; caustic soda goes into the manufacture of rayon, and of soap—from which glycerine for explosives is obtained; chlorine is so important to the successful prosecution of the war that it is under complete Government allocation. These and many other Diamond products have important jobs to do in arming Uncle Sam and our Allies.

In such activities, the same high quality and dependable uniformity that in peacetime made Diamond products the first choice of experienced buyers, makes these products doubly valuable today.

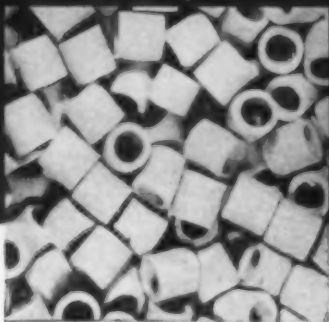
And when the war's end again permits civilian requirements to be filled, experience will lead to Diamond!



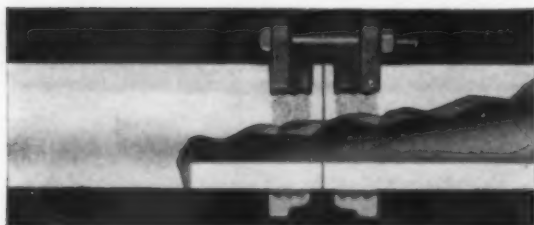
DIAMOND ALKALI COMPANY

PITTSBURGH, PA., and Everywhere

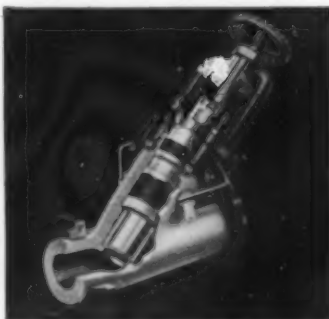
**WHEN BIG PRODUCTION
INVOLVES
EFFICIENT HANDLING OF
CORROSIVE LIQUIDS**



Raschig rings of Lapp Porcelain facilitate gas absorption processes by prohibiting contamination, and by standing up without crumbling under longest, most severe duty.



Lapp Chemical Porcelain Pipe is available in all standard sizes up to 8" inside diameter. Its ground ends permit installation with thin hard gaskets, eliminating at its source the chief cause of trouble in most corrosion-free pipe.



The Lapp Valve is designed to bring liquids into contact only with porcelain. Fine grinding, polishing and lapping of bearing surfaces—and a unique spring washer arrangement—assure smooth action, and a permanently maintained seal, even under vibration and thermal change.

Lapp Chemical Porcelain
is the first...and quickest...answer

ENGINEER To installations for industrial-scale processing of corrosive liquids, Lapp Chemical Porcelain offers notable advantages:

QUICK AVAILABILITY. None of the materials of porcelain itself is on the critical list. Lapp facilities are adequate for the production of a large volume of porcelain pieces. For pipe flanges, valve hardware and other metal parts, reasonable priority ratings are sufficient for nearly anything can be put on a delivery schedule to fit any construction program.

CHEMICAL PURITY. As a material of construction, Lapp Porcelain brings the purity always associated with laboratory porcelain to industrial processing. Completely iron-free, it is a dense, thoroughly-vitrified non-porous body, smooth and corrosion-free.

STRENGTH AND LONG LIFE. The fragility which the word "porcelain" sometimes suggests is not a property of Lapp Porcelain. This material is remarkably rugged, able to withstand mechanical shock of surprising intensity. As a major contributing factor in its purity and long life both, is its complete non-porosity—it does not absorb the liquids exposed to it. The only exposure is on the surface... the body cannot be weakened by the capillary forces of penetrating liquids.

ENGINEER A phone call or letter will bring a quick answer as to how Lapp Porcelain can help you meet your processing problem, quickly and with top production performance. Lapp Insulator Co., Inc., Chemical Porcelain Division, LeRoy, N. Y.

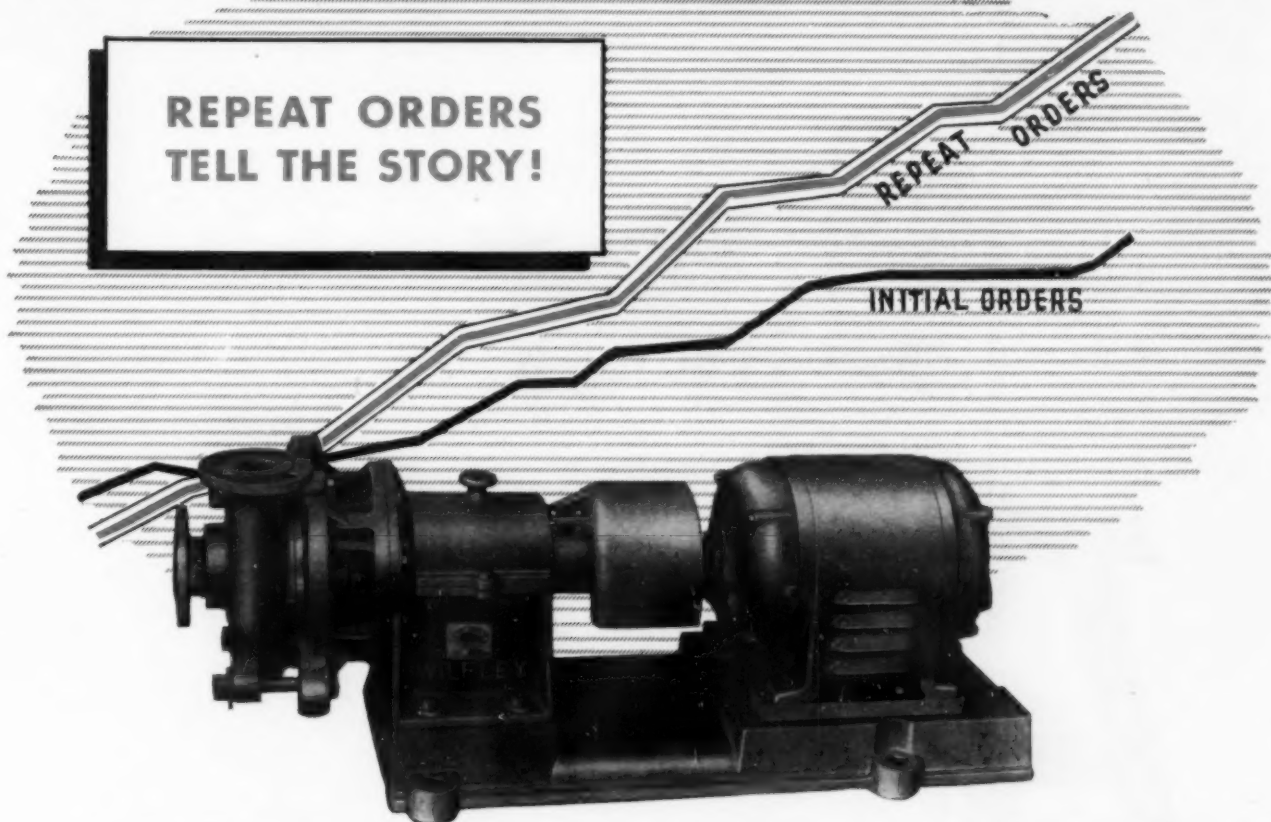
Lapp

Chemical Porcelain

Valves • Pipe • Raschig Rings

1936 1937 1938 1939 1940 1941 1942

**REPEAT ORDERS
TELL THE STORY!**



WILFLEY

ACID PUMPS

The chart above tells a graphic story of production. The black line represents pumps sold to NEW WILFLEY users during the past few years while the red line shows how these same users, having *tried* the WILFLEY, ordered additional pumps. Many of these plants have changed to WILFLEY Acid pumps *exclusively*—others are rapidly following suit.

Elimination of the stuffing box means elimination of ALL stuffing-box troubles—insures trouble-free production 'round the clock, for either continuous or *intermittent* pumping jobs. Made in 10- to 1,000-G.P.M. capacities; 15- to 125-ft. heads and higher. Individual engineering service. Write for complete details.

A. R. WILFLEY & SONS, Inc., Denver, Colorado, U. S. A.
NEW YORK OFFICE: 1775 BROADWAY, NEW YORK CITY, N. Y.

ACID PUMPS • UNITARY • BELT DRIVE • DIRECT DRIVE

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★



for Excellence

E for excellence . . . the Army—Navy Production award for high achievement in the production of materials for war . . . is today the proud possession of the men and women of Kemp of Baltimore.

Their service to their country, which has brought this signal honor, has, in turn, aided others in performing distinguished war service. Kemp Industrial Carburetors are firing specialized combustion equipment to speed production of small arms ammunition. Kemp Inert Gas Producers are stepping up the volume of synthetic ammonia. Smokeless powder plants, aviation gasoline and synthetic rubber plants are other users. Kemp dehydration equipment is rendering effective service in chemical warfare and ordnance works.

Their pride in this high honor is matched only by their determination to remain deserving of it. We pledge ourselves, every last one of us, to keep the E flying . . . *proudly!* **The C. M. Kemp Manufacturing Company, 405 East Oliver St., Baltimore, Maryland.**

KEMP of BALTIMORE

THERE'S SUCH A THING AS MAKING A SCIENCE OF PEEPING



Photo by Palmer, in an Allegheny Ludlum plant

★ With this melter, studying the action of some 35 tons of alloy steel in an Allegheny Ludlum electric furnace, peeping is a science:

He can determine whether adjustments to the electric power are needed to progress the melt at the proper pace; or whether additional slagging material must be added to prevent too rapid oxidation and consequent loss of critical alloys. His is one of the earliest in a long series of precise operations which brings a batch of Allegheny Stainless to its final wrought or cast form, rigidly true to specifications.

Stainless steel has often been called a "precious" metal. At no time has the term been more true than now. It is more than important, it is imperative that every pound of stainless be selected wisely and used well. It must be used to make the maximum amount of finished war equipment and parts with the least possible loss in rejects or spoilage. Even the use of high alloys, where a lower alloyed steel would suffice, is a form of waste. ● Let us help you to conserve the nation's supply of vital alloys; especially if, as a conversion plant,

stainless steel is a comparatively unfamiliar material to you. Fabrication data, and the personal assistance of our Technical Staff, are yours on request.



Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA

ALUMINAS

As Catalysts, Carriers, and Auxiliary Catalysts

THESE ALUMINAS ARE SUITABLE FOR CATALYTIC PURPOSES

ACTIVE TYPES

ACTIVATED ALUMINA

This is a catalytically active material when used alone or as a catalyst support. The pores of the granules occupy 50% of the particle volume.

HYDRATED ALUMINA C-730

This Alumina is active after an original heating to 500°F. It has finer particles and greater surface area than are obtainable with ground natural materials.

INACTIVE TYPES

TABULAR ALUMINA

This Alumina is a porous form of granular corundum produced from pure aluminum oxide. It is a substantially inactive catalyst carrier. Close mesh sizes are obtainable.

MONOHYDRATED ALUMINA D-50

This is a substantially inactive powdered Alumina having crystal structure different from the usual Aluminum Trihydrate. The average particles are 1 micron in diameter.

Aluminas, used as catalysts, help to increase the yield in the large-scale synthesis of high octane gasoline. They enter into the production of such materials as synthetic rubber, plastics, and explosives, all vital to the war effort.

When active catalysts are mounted on Alumina carriers, it is frequently possible to increase yields and to operate at lower temperatures. Because the Aluminas are pure, there is less likelihood of

uncontrolled side reactions and poisoning. The physical properties of Aluminas suit them for long use with continued high productive capacity.

Aluminas may give your catalytic reactions a boost. Samples are available for trial in your processes, if you are making war materials. ALUMINUM COMPANY OF AMERICA (Sales Agent for ALUMINUM ORE COMPANY) 1910 Gulf Building, Pittsburgh, Pennsylvania.



ALUMINUM ORE COMPANY

ALUMINUM AND FLUORINE COMPOUNDS



CONTINUOUS-TOOTH
HERRINGBONE
GEAR AND PINION

"General GEAR"

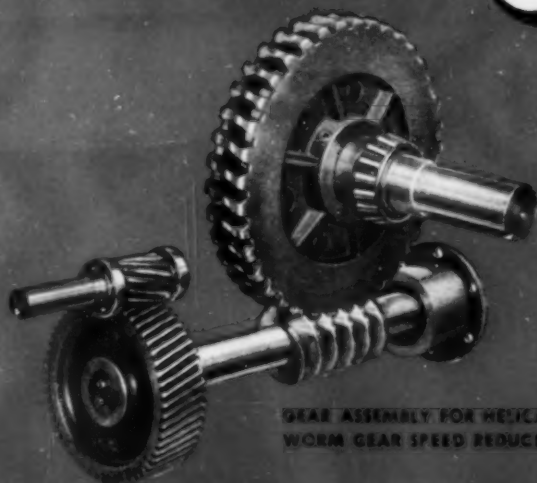
IS A FIGHTER TOO...

- ★ He's the guy that makes the Jeeps Jump... He's also the BIG-WORKS in the tank, battleship or airplane... in fact he's the BIG-WORKS in any Power-saving or Power-driving Machinery. HE'S GOTTA BE GOOD. Our organization of many years of Gear Making Experience is going to keep him fighting and to help keep all of us on top.
- ★
- ★
- ★

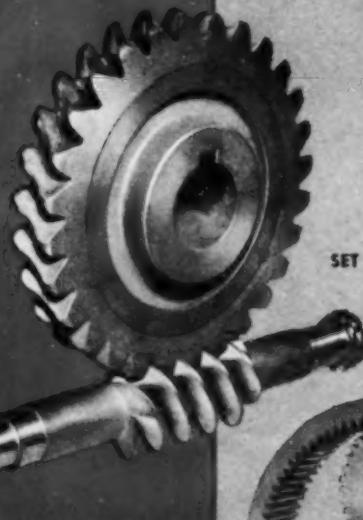
D.O. James

D. O. JAMES MANUFACTURING CO.

1140 WEST MONROE ST., CHICAGO, ILLINOIS



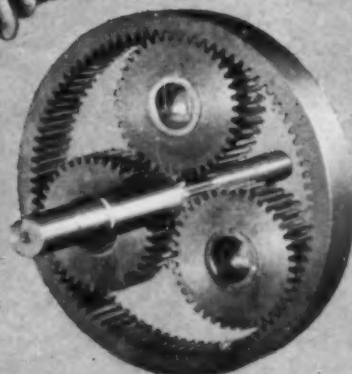
GEAR ASSEMBLY FOR HELICAL
WORM GEAR SPEED REDUCER



SET OF WORM GEARS



A SET OF SPIRAL
BEVEL GEARS
WITH PINION
BEARING MOUNTING



A SET OF PLANETARY GEARS

MAKERS OF EVERY TYPE OF GEAR AND GEAR REDUCER



"CONTINUOUS?"

*...we're almost never down
with this **SWENSON**
Cast Lead Evaporator"*

Manufacturers of Chemical Equipment Since 1889

FOR GREATEST EFFICIENCY IN HANDLING CORROSIVE LIQUORS, YOUR EQUIPMENT MUST BE DESIGNED SPECIFICALLY FOR YOUR PARTICULAR JOB

First cost of your evaporator is an item, of course . . . but it is relatively unimportant compared to operating and maintenance costs. Evaporator installations most successful in over-all economy are those carefully engineered by men whose experience in handling similar problems enables them to design equipment which fulfills the conditions imposed by the particular problem . . . equipment that requires a minimum of service.

Swenson Experience

The wide experience of Swenson Engineers in designing and building equipment for every type of evaporation process extends over more than half a century. These men are qualified to coun-

sel you as to the most efficient type of equipment for your purpose. Swenson Engineers are backed by a broad program of research which provides them with first-hand technical information . . . and by manufacturing facilities which permit every detail of construction to be carried out under close technical supervision.

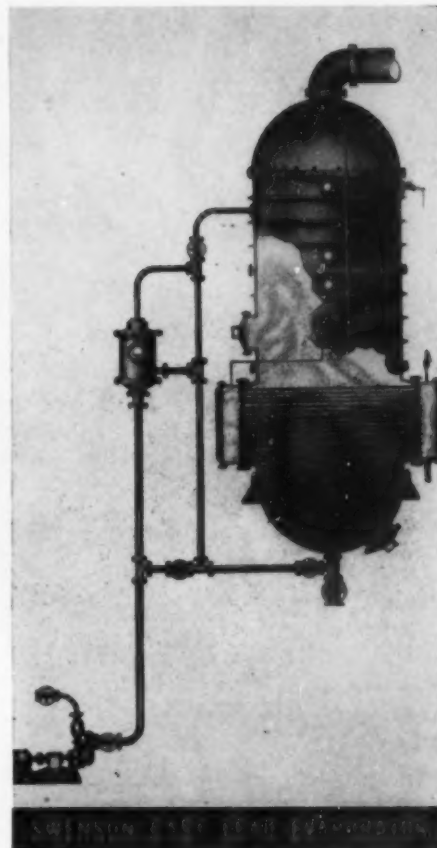
Swenson Five-Way Service

Although the Swenson Evaporator Company manufactures chemical equipment, it sells much more than that. Swenson delivers a Five-Way Service that covers every detail from the analysis of individual requirements to the ultimate assurance that those requirements have been satisfactorily fulfilled.

SWENSON EVAPORATOR COMPANY

Division of Whiting Corporation
15669 Lathrop Ave.

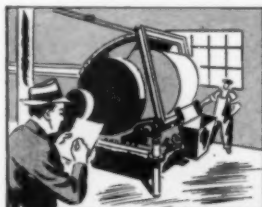
Harvey, Ill.



An outstanding Swenson development is the Cast Lead Evaporator for the concentration of acids and other corrosive solutions. The evaporator body is constructed of sections of cast lead, with heating tubes of "Karbate" impervious graphite. Sectional construction permits localized repairs. The horizontal tubes are readily accessible and easily replaced. Thus, in every construction detail, great care has been taken to assure low maintenance cost and simplification of the operating problems customarily associated with the evaporation of corrosive liquors.

ONLY SWENSON PROVIDES THIS FIVE-WAY SERVICE

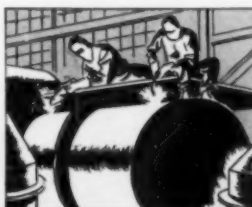
1. Analysis of Requirements



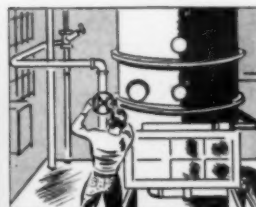
2. Design and Layout



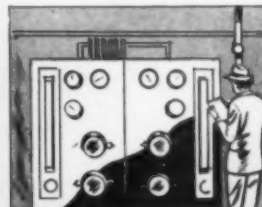
3. Manufacture of Equipment



4. Test Operation



5. Periodic Check-ups



SWENSON

EVAPORATORS • FILTERS • CRYSTALLIZERS

**Because Your Motors
May Have to Serve for the Duration**

Send for

**These New Century Bulletins on
Proper Motor INSTALLATION,
CARE, and ADJUSTMENT**



*Whenever Possible—
Order Standard
Motors*

Constant speed, continuous duty, open rated 40° C. sleeve bearing. 60 cycle, 3-phase motors are produced in larger quantities than other types and therefore can usually be shipped faster.

★ To help all Century Motor users get longer life from motors now in service, Century offers, free, the following helpful, informative bulletins on motor Care — Installation — Adjustment:

Squirrel Cage Polyphase Motors,
1/6 to 400 HP

Integral HP Direct Current Motors

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Because all Century Motors and Generators now being produced must go to the War Effort, proper motor care and protection is now more essential than ever before. Century Motors are working 'round the clock, often on continuous, 24-hour production — three times normal peace-time use.

To get the most out of your Century Motors, to assure longest, most economical operating life, ask your Century Application and Service Engineer for copies of these new Bulletins, or write direct today.

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1806 Pine Street

St. Louis, Missouri

One of the Largest EXCLUSIVE Motor and Generator Manufacturers in the World. — Offices and Stock Points in Principal Cities.



CENTURY ELECTRIC COMPANY—1806 Pine Street - St. Louis, Mo.

Please send me "Installation—Care—Adjustment" booklets on the following types of Century Motors:


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| <input type="checkbox"/> Split Phase | <input type="checkbox"/> Direct Current Motors |
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| <input type="checkbox"/> Capacitor | |
| <input type="checkbox"/> Squirrel Cage | <input type="checkbox"/> Generators—Direct Current |

Name.....

Company.....

Address.....

City..... State.....

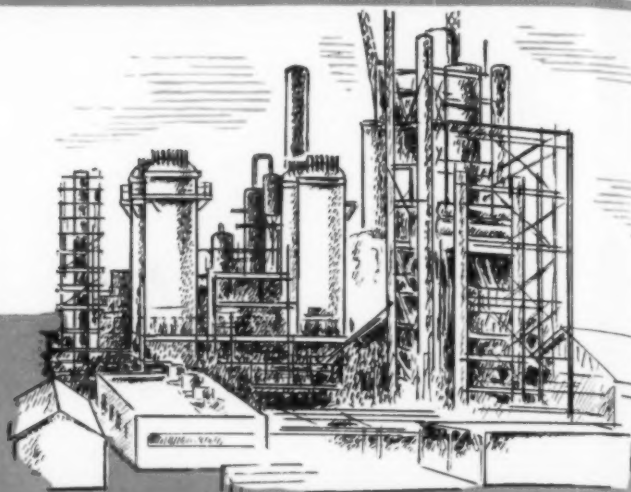


**More Than
200,000 Barrels
Per Day Capacity...**

6 Years of Commercial Operation

HOUDRY CATALYTIC CRACKING PROCESS

—commercially proved catalytic cracking process producing most of America's 100 octane aviation catalytic cracked base stock.



Commercially proved in 1936, Houdry was the first—and for six years the only process producing aviation base stock by catalytic cracking.

Among Houdry features are: high yield of high quality base stock; isobutane and isopentane production with low gas and coke; also low alkylate

blending requirements.

The sixteen Houdry Catalytic Process units in operation in this country have a charging rate of more than 200,000 barrels per day. Houdry units under construction will soon increase this capacity to 300,000 barrels per day.

Thermoform Catalytic Cracking Process

Latest development available under Houdry license is Thermoform Catalytic Cracking which offers—

- the additional advantages of continuous, counter-current cracking
- a saving of 50% in strategic materials and a comparable saving in investment

(over a complete plant) by the conversion of existing cracking facilities.

The addition of reactor, thermoform kiln, catalyst elevators and facilities — will convert any existing thermal cracking or topping unit to a Thermoform Catalytic Cracking Plant.

THE LUMMUS COMPANY • 420 LEXINGTON AVENUE, NEW YORK, N. Y.

600 SOUTH MICHIGAN AVENUE, CHICAGO, ILL. • 2315 TANGLEY ROAD, HOUSTON, TEXAS • 70 BARN HILL, WEMBLEY PARK, MIDDLESEX, ENGLAND
FLORIDA 671, BUENOS AIRES, ARGENTINA

LUMMUS

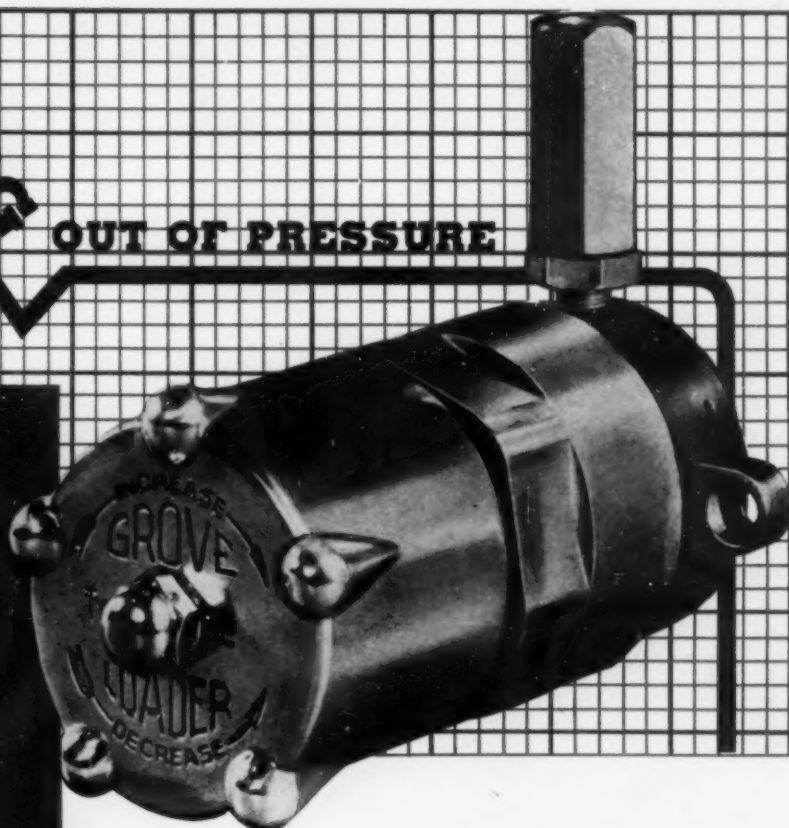
PETROLEUM REFINING PLANTS

TAKE THE

ZIG ZAG

OUT OF PRESSURE

WITH
GROVE
Automatic
PRESSURE
REGULATING
VALVES



EXTREMELY ACCURATE
SMALL CAPACITY HIGH PRESSURE REGULATOR
SUITED TO MANY USES:

The GROVE DOME LOADER, originally designed for use with Grove High Pressure Powreactor Dome Regulators which operate on the Pressure-balance principle can be employed in many other industrial applications. It is a spring and diaphragm operated small capacity high pressure regulator within itself. It makes possible a smooth manual remote control of pressure in a closed vessel, providing the necessary automatic operation to maintain this pressure even though pressure changes occur due to variations in temperature. Ideal for use in laboratories and as a reducing pilot. Write for complete details today.

THE SAME UNIT AROUND WHICH
GROVE PNEUMATIC GAUGE COM-
PARATOR IS DESIGNED AND BUILT...

The Grove Dome Loader is the basis of this fine precision-built testing instrument which is employed for accurately checking Pressure Gauges without removing them from panels or mountings. Bulletins available.



1. Remote Pressure Control to Power Cylinders and Motor Valves
2. Maintaining Gas Pressures on Liquid Containers
3. Control Fluid Seals on Stuffing Boxes, Vacuum Systems
4. Controlling Pilot Flames, Testing Apparatus
5. Controlling Hydraulic Pressures, Testing and Process Presses
6. Maintaining Constant Pressures, Reaction Vessels
7. Holding Back Pressure, Experimental Process Systems
8. Controlling Flow Rates in Blending Operations
9. Controlling CO₂, Nitrogen, Hydrogen at High Pressure
10. Maintaining Lubricating Oil Pressure, Machine Bearings
11. Safety Shut Off, Small Volume Flow Lines
12. Remote Manual Pressure Control Stations Operating in Combination with Grove Reducing Valves

WRITE TODAY FOR GROVE
LOADER BULLETIN—Outlining
Your Specific Requirements

GROVE



Pressure Control
EQUIPMENT

G R O V E R E G U L A T O R C O M P A N Y

1197 67TH STREET, OAKLAND CALIFORNIA

BRANCH OFFICES: 5644 NAVIGATION BLVD., HOUSTON, TEXAS • 30 ROCKEFELLER PLAZA, NEW YORK CITY, N. Y.



AIR — against WATER

Rising and falling with the waves . . . men on a rubber raft . . . human lives snatched from the sea . . . by a thin layer of inflated rubber.

Important? Yes. It's important that the thin sheets of rubber be kept free of cracks and blisters, that the raft unfold easily, that it be *safe* when it's needed.

That's why rubber life rafts are processed in special air conditioned rooms . . . to make the rubber tough and long-lasting. *Room temperature and humidity are maintained more exactly than ever.*

To do jobs like this, air conditioning equipment must be more precise, more flexible, more compact. Required "climates" must be reproduced faithfully . . . wherever and whenever wanted.

General Electric has already taken an outstanding part in developing this new kind of air conditioning for war industries. After the war, *all* users of air conditioning will benefit from the lessons we have learned in meeting these stringent war requirements.

More people will enjoy air conditioning because it will be more compact . . . more economical. Cars will have it. Also planes and boats. Small stores, as well

as large, will want it to increase sales, to keep goods fresh. Factories will demand it as an aid to production.

The place to turn for this new equipment will be General Electric . . . a logical source of heating, refrigeration, air conditioning, and heat transfer equipment of all kinds. Turn to G-E.

Air Conditioning and Commerical Refrigeration Department, Division 427, General Electric Co., Bloomfield, N. J.

Air Conditioning by
GENERAL  ELECTRIC



"dag" COLLOIDAL GRAPHITE AS A PARTING COMPOUND

Its lubricating value, its heat and corrosion resistance, and its lack of affinity for other chemical elements, make "dag" colloidal graphite an ideal parting compound, that is, a substance to prevent one part sticking to another due to the action of heat, corrosion, or chemical action.

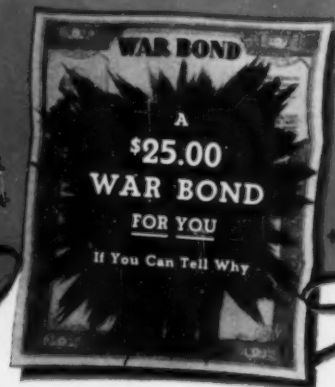
"dag" colloidal graphite is especially useful in keeping molten glasses from sticking to molds; in keeping electric lamps from sticking in their sockets; to facilitate the removal of adhesive from the rolls used in making corrugated paper; also as a parting compound in metal and rubber molding. "dag" col-

loidal graphite keeps bolts, studs, and pipe threads in a condition to be uncrowded easily when necessary. It also makes it possible to tighten bolts and pipe connections to a greater extent than is possible without the colloidal graphite treatment.

Difference Between Colloidal and Powdered Graphite

"dag" colloidal graphite dispersions should never be confused with disper-

"dag" COLLOIDAL GRAPHITE IS IMPORTANT In the Manufacture Or Use of These Products



HERE ARE THE RULES

Acheson Colloids Corporation will give a \$25.00 War Bond to each of the 5 people who submit complete and accurate answers together with the 5 best letters on the question, "Why is 'dag' colloidal graphite important in the manufacture and/or use of the twelve products pictured here?" (1) State business connections (no one in the graphite field or their families will be eligible). (2) All entries must be legible. (3) All entries must state the publication in which the advertisement was seen. (4) Entries must be postmarked not later than January 15, 1943. (5) In case of ties, duplicate awards will be made. (6) Entries become the property of the Acheson Colloids Corp. (7) The verdict of the judges will be final.

sions of powdered graphite which have not the same properties. "dag" colloidal graphite particles are many times smaller than the particles of powdered graphite—so small they readily pass through the smallest pores of filter paper. In fact, they go wherever their liquid carrier penetrates. The carefully controlled Acheson process of colloidalization imparts to these particles a property powdered graphite does not have. This is "Brownian Movement" which enables colloidal graphite to remain in suspension indefinitely.

"dag" is a registered trade-mark of the Acheson Colloids Corporation.

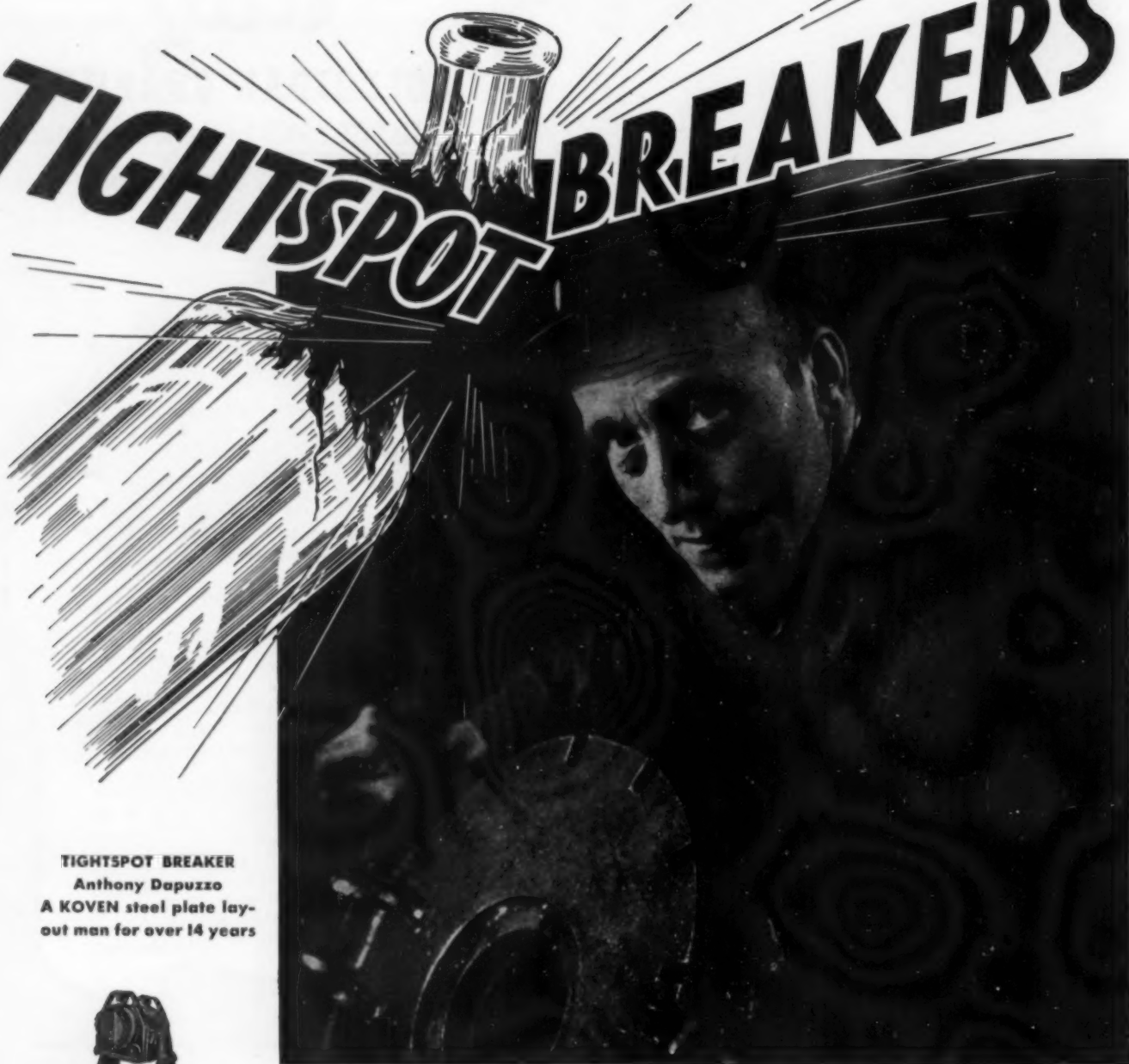
dag
COLLOIDAL
PRODUCTS

ACHESON COLLOIDS CORPORATION, Port Huron, Mich.

Write
for **NEW BULLETIN 422R**
on the use of **"dag"**
Colloidal Graphite as
a Parting Compound

dag
COLLOIDAL
PRODUCTS

TIGHTSPOT BREAKERS



TIGHTSPOT BREAKER
Anthony Dapuzzo
A KOVEN steel plate lay-
out man for over 14 years



KOVEN'S immense fabricating facilities plus the outstanding experience of all its employees as typified by Anthony Dapuzzo, enables KOVEN to offer you The Ideal Solution To Your Increased War Effort Equipment Needs...

Individualized Equipment! This equipment assures efficient production because it is conceived and produced by KOVEN TIGHTSPOT BREAKERS...who are specialists in their respective fields...loyal Americans, designers, engineers, welders, machinists, who cooperate to supply each manufacturer with equipment that meets his specific requirements. Now, with the Dover Boiler and Plate Fabrication Division added, KOVEN offers greater fabricating facilities than ever.

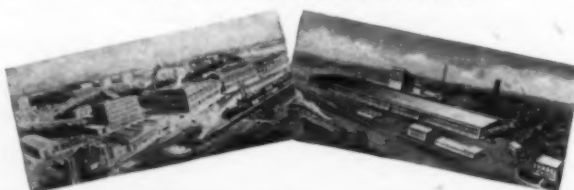
Among the many KOVEN pieces of equipment are: pressure vessels, extractors, mixers, stills, condensers, kettles, tanks, chutes, containers, stacks, coils.

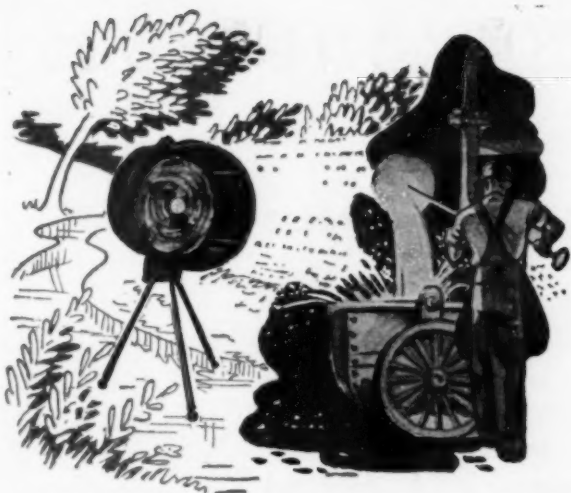
L. O. KOVEN & BRO., INC.

154 OGDEN AVENUE

PLANTS: JERSEY CITY, N. J., DOVER, N. J.

JERSEY CITY, N. J.





BRING REFRESHING OUTDOORS INDOORS

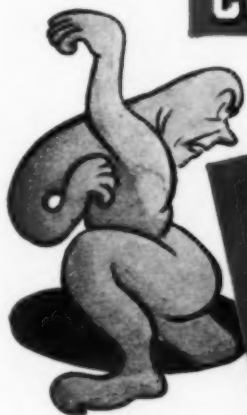
Avoid the production slumps and poor work that always result from "hot weather fatigue." Men work better in moving air. Coppus Heat Killers move more air at less cost — direct the air onto the job — and prevent re-circulation of stale air. They are Coppus "Blue Ribbon" Products that can stand plenty of use and abuse.

COPPUS

RUN... DON'T WALK... TO NEAREST EXIT

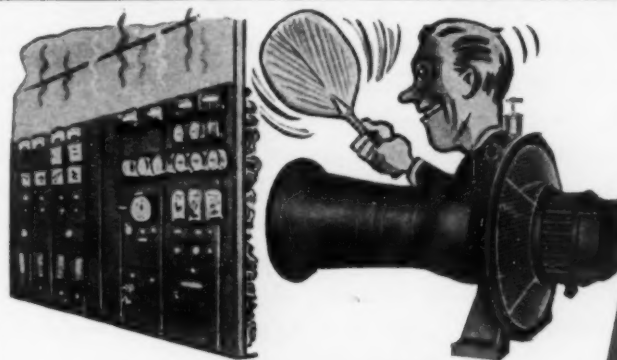
Noxious fumes and foul gases run away fast from a Coppus Cable Manhole and Tank Ventilator. Its powerful draft quickly clears the air in a tank or manhole — keeps fresh air circulating so men can work without discomfort. Large volume through small outlet. Usable anywhere. Look for the "Blue Ribbon!" That's the stamp of dependability you can bank on.

COPPUS



1001 USES

Two general types of Coppus Blowers and Exhausters — one for high velocities of air, the other for large volumes — have been modified many times for special purposes. Check off the applications which fit your needs, and have us send you specific information and prices.



DON'T LET EQUIPMENT GET "HOT-HEADED!"

Over-heated electrical equipment, like a hot-headed man, can cause a lot of trouble. Keep motors, generators and wires cool and on the job with Coppus Blowers! They supply the needed amount of cooling air at all times. Initial cost is moderate, and they are dependable as the famous "Blue Ribbon" indicates.

COPPUS

MAIL THIS COUPON

To Coppus Engineering Corp., 270 Park Avenue, Worcester, Mass. Sales offices in Thomas' Register. Other "Blue Ribbon" Products in Sweet's & Chemical Engineering Catalog Product Reference.

COPPUS "BLUE RIBBON"
BLOWERS AND EXHAUSTERS
DESIGNED FOR YOUR INDUSTRY
... ENGINEERED FOR YOU

PLEASE SEND ME INFORMATION ON Supplying Fresh Air to Men Working:

- | | | |
|--|--|---|
| <input type="checkbox"/> in tanks, tank cars, drums, etc. | <input type="checkbox"/> on boiler repair jobs. | <input type="checkbox"/> exhausting welding fumes. |
| <input type="checkbox"/> in underground cable manholes. | COOLING: | <input type="checkbox"/> stirring up stagnant air wherever men are working or material is drying. |
| <input type="checkbox"/> on coke ovens. | <input type="checkbox"/> motors, generators, switchboards. | <input type="checkbox"/> drying of walls, sheets, etc., after treated with coating material. |
| <input type="checkbox"/> on steam-heated rubber processes. | <input type="checkbox"/> wires and sheets. | |
| <input type="checkbox"/> around cracking stills. | <input type="checkbox"/> general man cooling. | |
| | <input type="checkbox"/> supplying fresh air to storage tanks on tank farms. | |

(Write below any special ventilating problem you may have.)

NAME.....
COMPANY.....
ADDRESS.....
CITY.....

NATURAL GAS IS WHERE YOU FIND IT




The Job of the Geologist

BEHIND the natural gas service that industry on the Texas Gulf Coast takes for granted lie many unseen and unheralded operations. Gas is where you find it, and finding it is the job of the geologist. It's a far cry from the day of the "wiggle stick" and the "divining rod" to the scientific exploration for oil and gas prospects today. The science of geology embraces use of the torsion balance, the gravity meter, the magnetometer, the seismograph, and geochemical analyses in the attempt to locate a *geological prospect* where oil or gas *might* be found, and it's still an uncertainty, scientific though it may be. Our geologists are at work constantly, seeking out these geological prospects, and on the judgment of these technicians hinges the all-important work of leasing lands for natural gas exploration by drilling, adding to the company's already large reserves that are ample for many years to come.

Industry located on the Texas Gulf Coast has so many natural advantages—availability of raw materials, natural gas for fuel as well as raw resource, native-born labor, a mild climate, unex-

celled transportation facilities. The stimulation of war production has accelerated the industrialization of the Texas Gulf Coast country; production of war goods in this area has been the talk of the nation. Post-war expansion will be rapid, and many companies are now assimilating the facts upon which to make a decision regarding location of a new post-war plant. Our Research Department will be glad to furnish facts and figures on this region's resources and advantages, an engineered survey individualized to your company's products and processes. Just write Research Department, Houston Pipe Line Company, Petroleum Building, Houston, Texas, without obligating your company in any way.

For Victory Buy
United States War Savings Bonds

HOUSTON PIPE LINE CO.
Subsidiary of Houston Oil Company of Texas
Wholesalers of
Natural  GAS





21 INCHES OF FLEXIBLE METAL HOSE PROTECT HIS LIFE

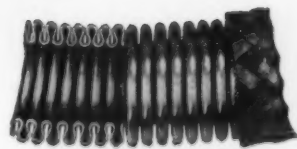
Instead of conveying oil, steam, gas or water, here flexible metal hose houses a parachute ripcord, protects it against mechanical injury, might save a man's life.

Using practically any workable metal, we can build flexible metal hose or tubing for anything from a simple oil can spout to a high pressure *seamless* hydraulic line that can be flexed millions of times without failing . . . a line that will give you the flexibility of garden hose, the dependability of metal and the *strength of rigid pipe*.

Could it be that some type of this hose or tubing is the "missing link" you have been looking for?

42199

AMERICAN METAL HOSE BRANCH OF THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Conn. • *Subsidiary of Anaconda Copper Mining Co.*
In Canada: *Anaconda American Brass Ltd., New Toronto, Ontario*



American "Seamless", no seams, welds or joints...pressure tight as the metal tube from which it is made.



American "Interlocked", most rugged type of hose...full interlocked joints are packed for pressure tightness.

American Metal Hose

ANACONDA
COPPER MINING CO.



We've Spilled the WORKS!

All the works—two discs and two wedges—four parts—the entire working part assembly of a Darling Double Disc Gate Valve. The seats are parallel. The discs are *fully revolving*, seating in a different position *each time* the valve is operated. This means tighter seating, less wear, longer operation, and lower maintenance costs with Darling Gate Valves. All four working parts are uniform and positive in action. They are simply designed, with no pockets to collect sediment or prevent free and easy

movement. Any part can be replaced quickly and inexpensively without removing the valve from the line. They cannot be incorrectly assembled or become disengaged while in service. It's an assembly that will more than pay its way in your plant.

At your service are the engineers of the Darling Valve & Manufacturing Company. They can solve your valve problems without cost or obligation to you. Wire or write, setting appointment at your convenience.



Darling offers you a quality line of longer-lasting Gate Valves. They come in Fully Revolving Parallel Seat Double Disc, also in Taper Seat—Slotted and Solid Wedge types. In service pressures up to 3000 pounds, you can get Darling Gate Valves in Cast Iron, Bronze, Forged Steel, Cast Steel, and Corrosion Resistant Alloys. Darling also manufactures Compression Type Fire Hydrants, Check Valves, Motor and Cylinder Operated Valves, and many accessories.



DARLING

MARK

VALVE & MANUFACTURING CO.

WILLIAMSPORT, PA.



ARMY

E NAVY

*A tribute
from the men who fight
to Struthers Wells men who
make their fighting equipment*

There's a common bond of understanding and appreciation of sacrifices between democratic free men, that spells defeat for world terrorists. Struthers Wells . . . to a man . . . accepts with justifiable pride the distinguished Army-Navy "E" Production Award "for high achievement in the production of war equipment."

The overwhelming determination of even greater war production achievement in our plants, is as typically Struthers Wells . . . as the always dependable precision, ingenuity and quality so consistently evidenced in Struthers Wells peacetime production.

TITUSVILLE, PA.

STRUTHERS WELLS CORPORATION

WARREN, PA.

Do You Know These Facts About HASTELLOY ALLOYS...

For Resistance To Severely Corrosive Media?

For resistance to severely corrosive media, use one of the four Hastelloy nickel-base alloys — A, B, C, or D. Many types of chemical equipment—such as valves, pumps, pipe and fittings, autoclave liners, heating or cooling coils, agitators, and acid concentrator tubes—are being fabricated from these high-strength alloys. Outlined here are some of their properties.



These are the Forms in Which You Can Get Them

CASTINGS



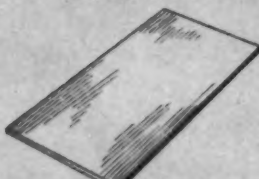
A, B, C, D

WELDING ROD



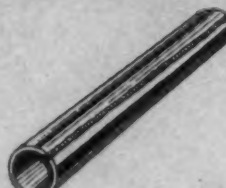
A, B, C, D

ROLLED SHEET
AND PLATE



A, B, C

WELDED TUBING



A, B, C

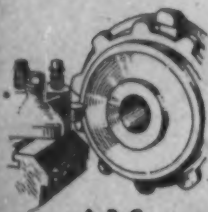
BARs, FORGINGS,
WIRE, DRAWN ROD



A, B

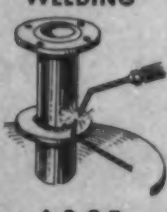
These are Some of the Ways in Which You Can Work Them

MACHINING



A, B, C

OXY-ACETYLENE
WELDING



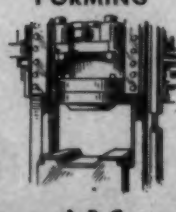
A, B, C, D

ELECTRIC
WELDING



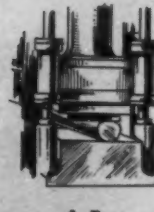
A, B, C

COLD
FORMING



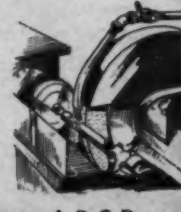
A, B, C

HOT FORGING



A, B

GRINDING



A, B, C, D

These are Some of the Corrosive Media They Resist

H_2SO_4
(DILUTE)



A, B, C, D

H_2SO_4
(CONCENTRATED)



D

HCL
(BOILING)



B

HCL
(ROOM TEMP.)



A, B, C

ORGANIC
ACIDS



A, B, C, D

ACID
CHLORIDES
(NON-OXIDIZING)



A, B, C

ACID
SULPHATES
(NON-OXIDIZING)



A, B, C, D

OXIDIZING
MEDIA



C



For Complete Information on penetration tests, available forms, and methods of fabrication of Hastelloy alloys, send for the booklet, "Hastelloy High-Strength Alloys." Test samples of these nickel-base alloys are also available.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York, N. Y.



Kokomo, Indiana

Chicago, Cleveland, Detroit, Houston, Los Angeles, San Francisco, Tulsa

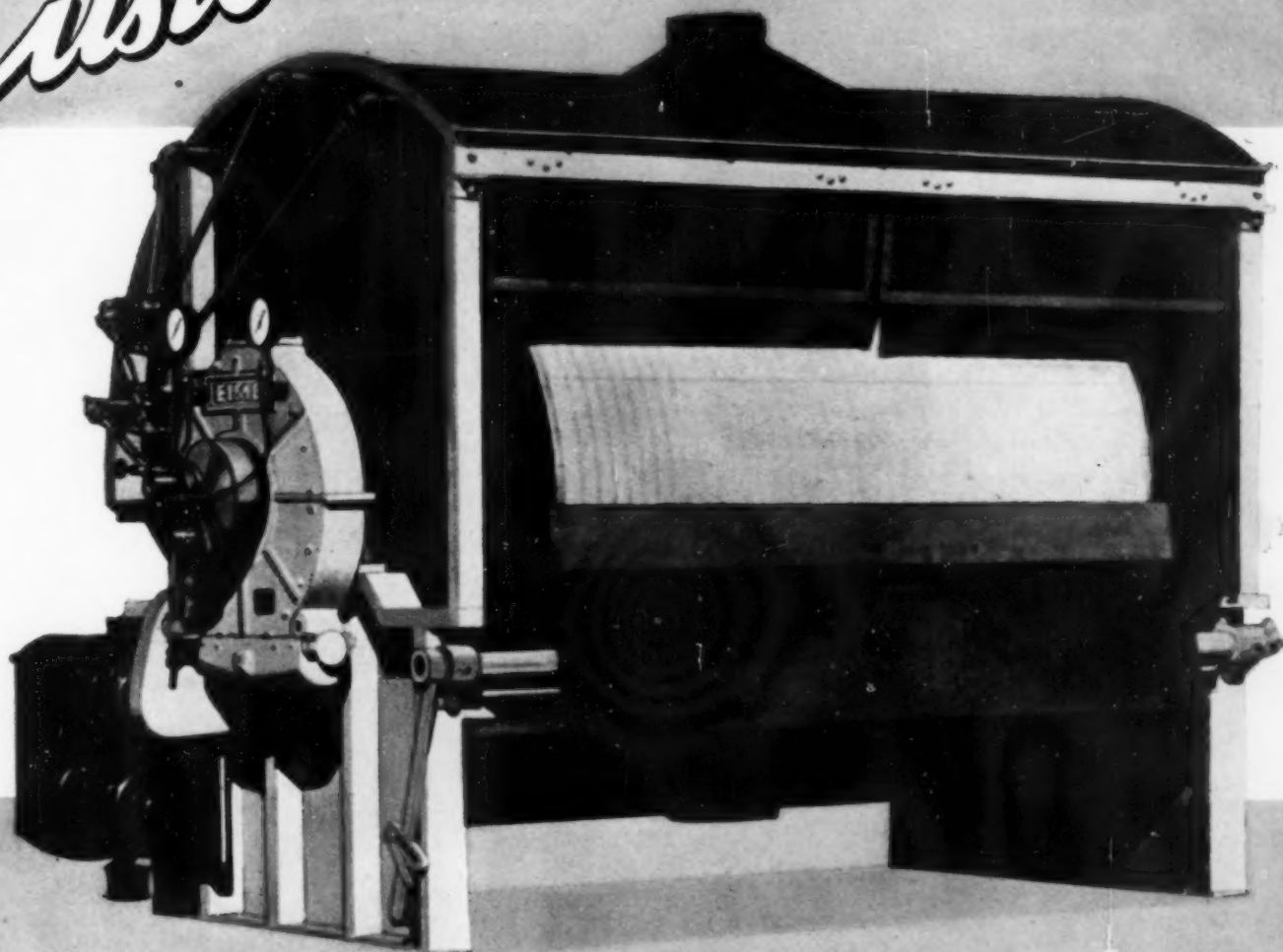
HIGH-STRENGTH NICKEL-BASE ALLOYS FOR CORROSION RESISTANCE

The word "Hastelloy" is a registered trade-mark of Haynes Stellite Company

68-12

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The all Everdur EIMCO continuous filter shown above, now operating smoothly and profitably in one of America's great processing industries, is representative of EIMCO simplicity, ruggedness and special adaptation to plant demands. The unit is a product of a manufacturing

company that is exceptionally well prepared to design and furnish not only the filtering installation but also all accessory equipment required for efficient and economical operation.

Bulletin No. 404 on Eimco "Custom Built" Filters will be sent to you on request.

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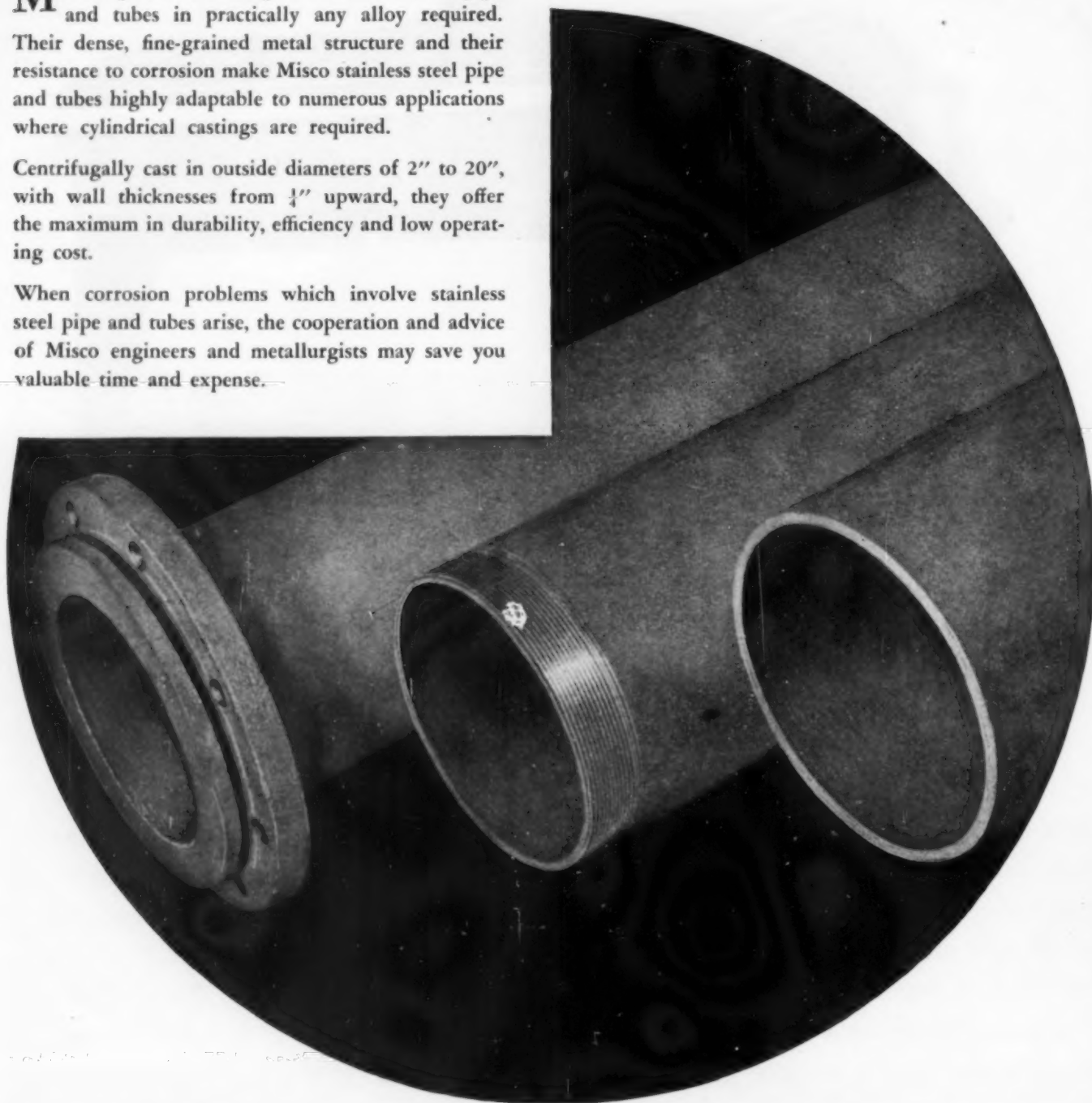
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MISCO produces a range of stainless steel pipe and tubes in practically any alloy required. Their dense, fine-grained metal structure and their resistance to corrosion make Misco stainless steel pipe and tubes highly adaptable to numerous applications where cylindrical castings are required.

Centrifugally cast in outside diameters of 2" to 20", with wall thicknesses from $\frac{1}{4}$ " upward, they offer the maximum in durability, efficiency and low operating cost.

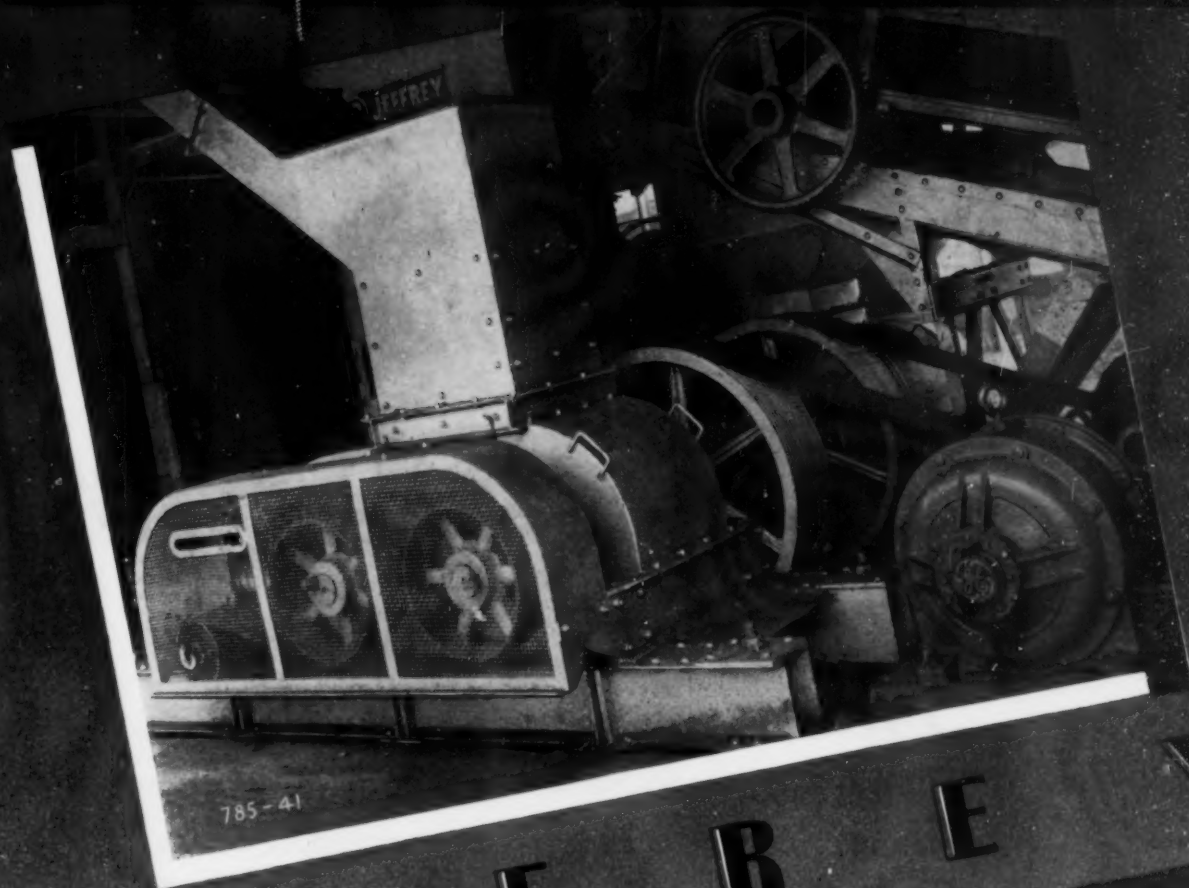
When corrosion problems which involve stainless steel pipe and tubes arise, the cooperation and advice of Misco engineers and metallurgists may save you valuable time and expense.



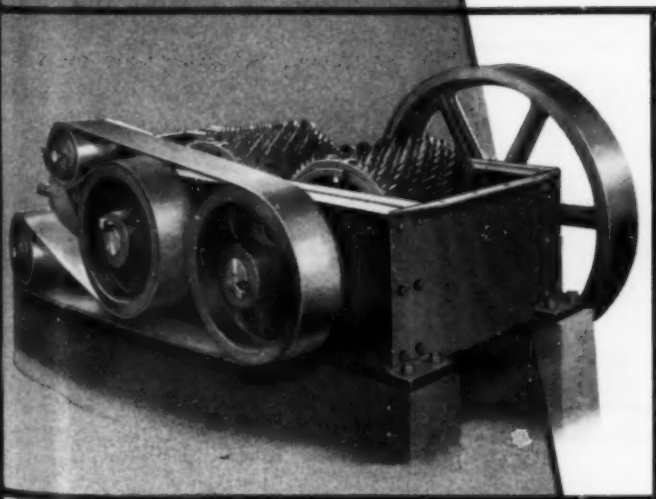
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MISCO
Specialty Castings in Resistant Alloys

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THE NATURAL CHOICE

Jeffrey crushing and pulverizing equipment . . . the preference of shrewd management for all kinds of special reduction operations on critical materials. The double roll crushers shown above are reducing coke to uniform size for use in the production of carbide, another example of our ability to serve the entire chemical industry. An opened-up view of the Jeffrey double roll crusher is shown at the left.

We can help you meet each new demand for a sized product . . . help you meet certain specifications exactly. Single, double roll and "Flextooth" crushers; rigid and swing hammer pulverizers and shredders; hammermills and grinders . . . designed by experienced reduction engineers to do the job right.

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your enemy!

Although he attacks and destroys your tubes slowly, he is as deadly a saboteur as the one who lurks in the shadow of your plant and awaits an opportunity to toss a bomb. Check up on him regularly. If your tubes are costing too much or are not good enough for the job they are required to do, investigate Sicromo tubes. We believe they provide the highest resistance to corrosion per dollar invested.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

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Buy War Bonds. Conserve Rubber. Eliminate Unnecessary Travel. Use the Telephone Only When Important. Salvage All Scrap and Waste Material.

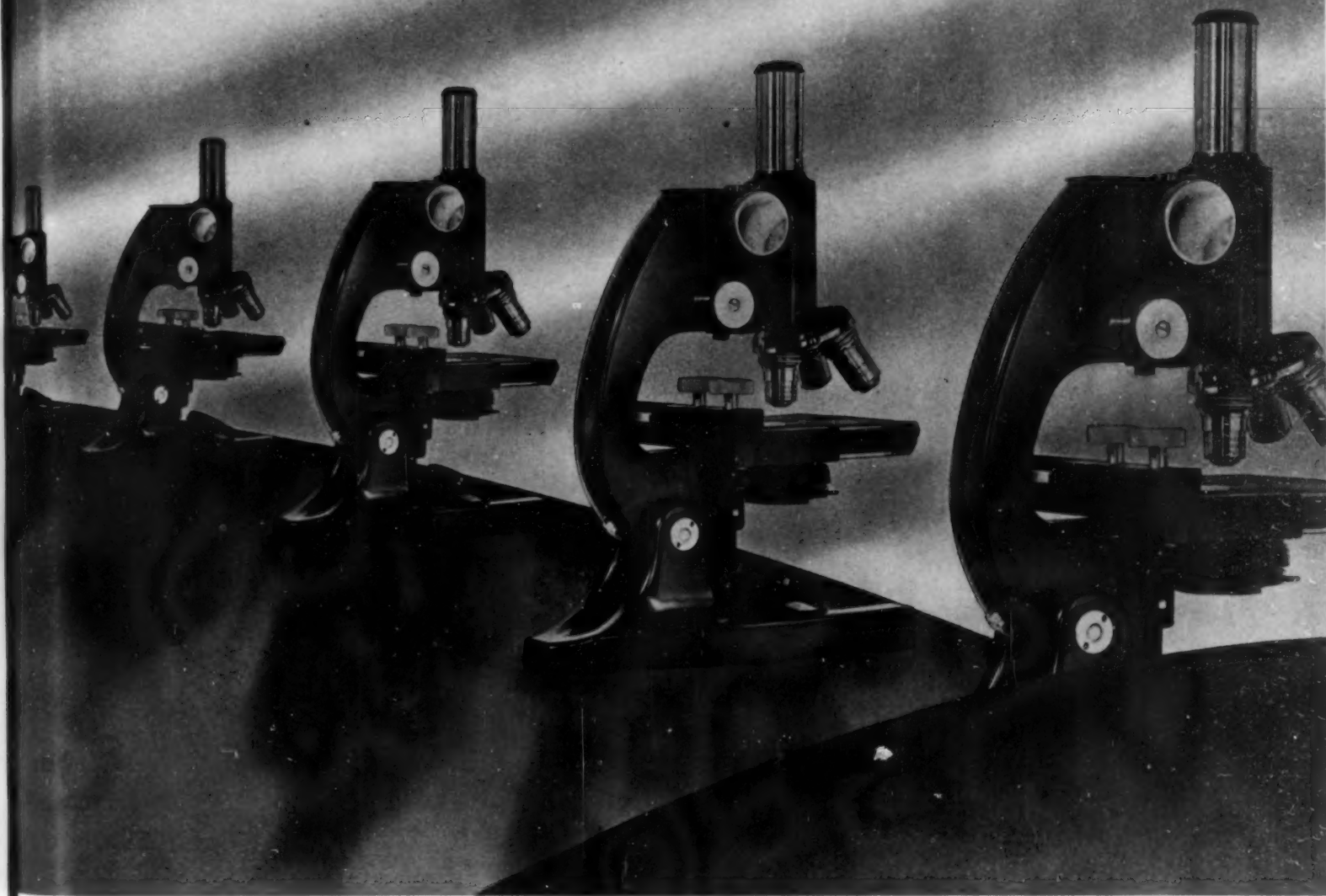
Proper
selection of ma-
terials is essential to
Victory today and
profits in post-war
tomorrow.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
SEAMLESS STEEL TUBES

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.



THE Army-Navy "E" Flag, with two stars added, signifies continuous achievement in Production for Victory. This is the fourth in a series of "E" awards received by Bausch & Lomb and its employees since the summer of 1941.



Sentries Along America's Battle Lines

IN white-walled hospital laboratories, in industrial research laboratories, in field laboratories, microscopes in the hands of American doctors and scientists are on twenty-four hour sentry duty.

Here, on America's second front, microscopists are waging an unending war against enemies of health and production, enemies that are invisible to the unaided eye.

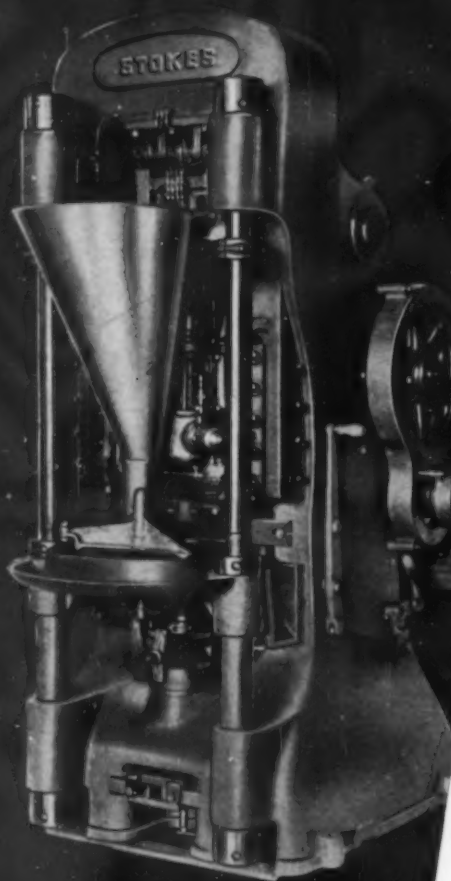
Bausch & Lomb Microscopes and

B&L specialized instruments of optical research and control are doing an invaluable job today.

From the toolmaker's microscope that helps to maintain the standards of accuracy and perfection to which America's war effort is geared, to the microscope of the medical officer fighting the hazards to health which, if unchecked, could put a division out of action, B&L instruments, through the men using them, are serving America.

Here at home, in laboratories, shop and factory, and along our far-flung outposts, wherever American industry and American fighting men are serving the cause of Victory, you will find Bausch & Lomb optical instruments on active duty.

BAUSCH & LOMB
OPTICAL COMPANY • ESTABLISHED 1853



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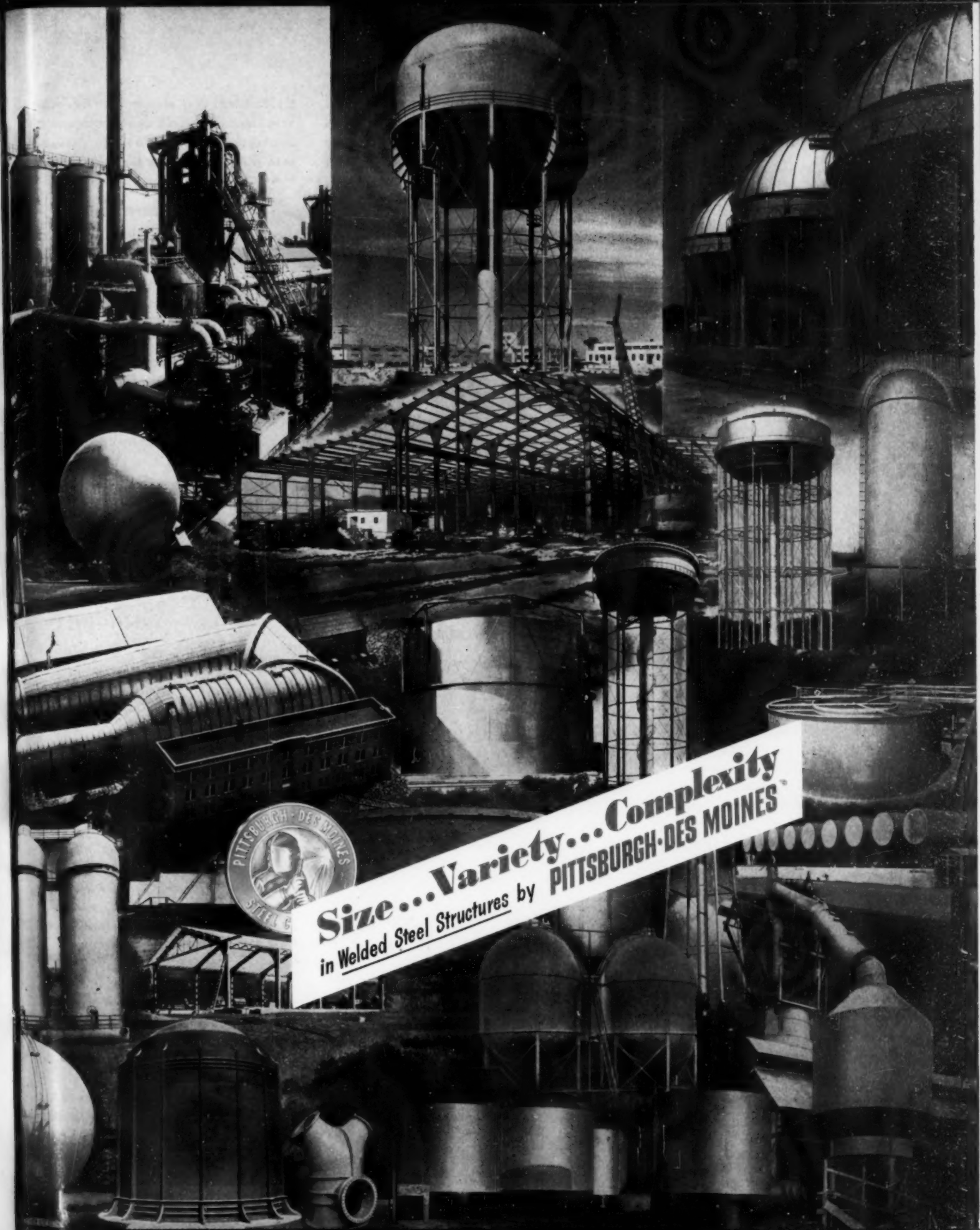
Tableting is a widely adaptable manufacturing process. It forms finished products from powders or granular materials . . . TNT Detonators, catalyst pellets, chemical cakes, color tablets, refined ore briquettes, many others. It produces parts from powdered metals, to accurate size and ready for sintering . . . iron gears, porous bearings, motor brushes, contact points, hard carbide cutting tools, etc. It is broadly applicable in the manufacture of pharmaceuticals, ceramics, hard candies, foods and plastics. Tableting speeds up production, lowers costs, simplifies procedures, saves labor, offers numerous other advantages. We build Tableting Machines and Presses especially developed for all the above, and other applications . . . have specialized in this type of equipment for nearly 50 years. Write for new, 48-page, illustrated catalog showing hundreds of tableted parts and complete line of Industrial Tablet Machines.

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**SODIUM PERBORATE
MONOHYDRATE
(NaBO₃ · H₂O)**

Active oxygen 15%, stable at ordinary temperatures, compatible with a wide range of materials for pharmaceutical compounding, and possessing a higher active oxygen content than sodium perborate tetrahydrate. Slight hygroscopic tendency. **Available in limited commercial quantities.**

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Active oxygen 8.5%. A specialty preparation having a pH in water suspension substantially the same as that for body fluids, plus the characteristic of slowly releasing its active oxygen over a period of time in contact with body tissue. Applications of value in the medical, dental, and veterinary fields. **Available in limited commercial quantities.**

**SODIUM PERCARBONATE
(2Na₂CO₃ · 3H₂O₂)**

Active oxygen 15%, molecular weight, 314. Water solubility 25-30 grams per 100 cc. at 30°C. Dissolves with negative heat of solution. pH of water solution 10-10.2. Good stability at room temperatures up to 110°C., and in high humidity. Suggested uses: Pharmaceutical, food industry, specialized industrial applications. **Available only in small quantities for experimental investigation.**

**POLYVINYL ALCOHOL
(CH₂ = CHOH)_x**

a white to cream solid powder soluble in water, insoluble in common organic solvents. Uses: adhesive, emulsifying agent, size for textiles, paper, leather, fabrics where grease and oil resistance is desired. Transparent, grease-proof films made from water solutions. Plasticized solid molded to grease and solvent-proof articles with rubber-like properties. **Commercially available in low, medium and high viscosity grades.**

**POLYVINYL ACETATE
(CH₂CHOOCCH₃)_x**

transparent, thermoplastic solid is soluble in esters, ketones, alcohols, acids, chlori-

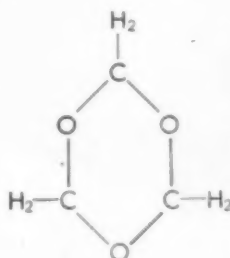
nated and aromatic hydrocarbons; insoluble in water, mineral and vegetable oils and fats, glycerin; water emulsions are stable. May be hydrolyzed to polyvinyl alcohol. Uses: Heat-sealing and solvent-activated adhesives, latex extender and substitute, binder for paper pulp and scrap leather, ingredient in textile sizing and finishing compositions and in compositions for molding rubber-like articles. **Commercially available in bead, solution and emulsion forms.**

**POTASSIUM CYANIDE
(KCN)
Domestic**

White granular product of high purity (96%) and uniformity. Uses: In silver plating, makes possible dense, smooth deposits; heavy fine-grained adherent coatings at high current densities; other material operating advantages. Also useful in gold and copper plating; heat treatment of steel (nitriding); chemical reagent. Made in the U.S.A. **Available in commercial quantities.**

TRIOXANE

White crystalline material, melting at 63—64°C., is a unique form of anhydrous formaldehyde. Its high degrees of compatibility with organic materials and the ease with which its reactions may be controlled should make it particularly attractive



for use in organic synthesis. In these respects it differs considerably from known commercial forms of formaldehyde. It is also unique in that it possesses no formaldehyde odor when pure and is relatively inert in the absence of strongly acidic catalysts. It is converted to reactive monomeric formaldehyde by traces of acidic catalysts such as mineral acids, zinc chloride, ferric chloride, etc. In the presence of these materials, trioxane reacts as formaldehyde with many organic compounds at a rate determined by the catalyst concentration and the temperature of the reaction media. In its

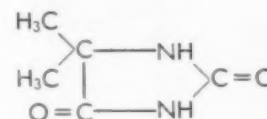
molten form it is also an excellent solvent alone or in combination with water, alcohol and other organic solvents. **Available in small quantities for experimental investigation.**

**VINYL CYANIDE
(Acrylonitrile)
(CH₂ = CH - CN)**

is a stable, colorless, mobile liquid, moderately soluble in water but completely soluble in alcohols, ether, acetone and other common organic solvents. Its extreme reactivity makes it a valuable intermediate for organic syntheses. The presence of the double bond, together with a reactive nitrile group permits typical reactions such as hydrolysis and esterification as well as a wide range of ethylenic additions with other materials. It can be made to polymerize by itself or with other polymerizable materials. Some of the resulting copolymers have found applications in the synthetic rubber field. **Under W. P. B. allocation, GPO M-153.**

DIMETHYL HYDANTOIN

is a white, odorless solid (M.P. 178°C.) which crystallizes in the form of prisms or needles from water, alcohol or diethyl ether. Deposits as needles when sublimed.



It is readily soluble in water, alcohol, diethyl ether and ethyl acetate. Uses: Resins and plasticizer intermediate; modifier for other water-soluble materials. **Available in small quantities for experimental investigation.**

Although many of these new chemicals are available only in limited quantities at this time, special consideration will be given to the commercial production of any of these products which may have immediate use in war production. For available technical information write to E. I. Du Pont de Nemours & Co. (Inc.), Wilmington, Delaware.

LIVING... THROUGH CHEMISTRY



*"ME AND NORDSTROMS,
WE KNOW HOW TO HOLD TIGHT"*



WATCHDOGS OF THE FLOW LINES

Nothing can pass a Nordstrom when it's in closed position. It's a watchdog in every sense of the word. Even if your line is accidentally loaded to twice the rated pressure of the valve, the latter will still hold tight. It's the

*"Those Nordstrom Valves with
Merchrome Coating are like me,
too—hard-faced for protection."*



The most valve

for your money

Because...

Sealing surfaces are never exposed to line contents; fully protected against corrosion and erosion.

Positive shut-off is assured regardless of how frequently or infrequently the valve is operated.

Efficient operation is maintained many times longer than other types.

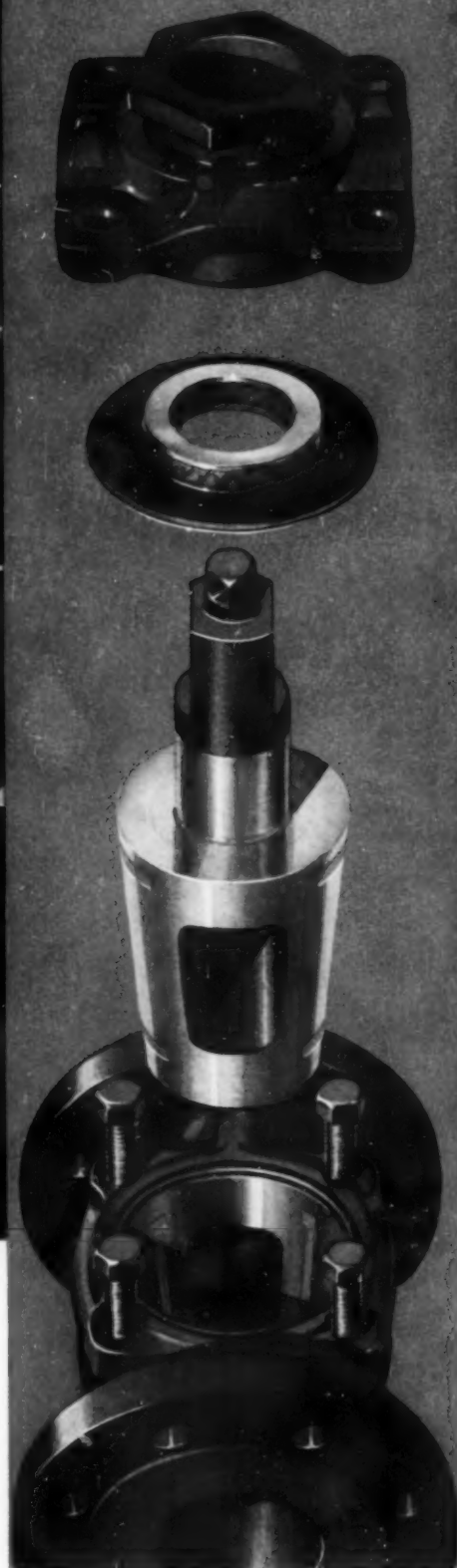
Nordstrom Lubricated Valves are of the plug cock type; the simplest of all valve designs. They require the minimum of working parts. Only the plug turns, to open or close.

The patented lubrication system assures quickest, easiest operation.

Lubricant under hydraulic pressure seals the ports against all leakage.

NORDSTROM VALVES

SIMPLE—POSITIVE—ENDURING
—real economy advantages



Ask for
Bulletin

MERCO NORDSTROM VALVE CO.

A Subsidiary of Pittsburgh Equitable Meter Co.

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—KEEP UPKEEP DOWN



SHORTAGES CAN BE A HELP

Shortages in some materials often lead to finding something far better

In the handling of nearly all kinds of industrial chemicals, chemical stoneware is fast replacing metals—and showing marked advantages. For instance, many manufacturers have found that chemical stoneware condensation coils are more economical, safer and more durable.

General Ceramics Chemical Stoneware is economical because its initial cost is low and its use practically eliminates

maintenance costs. It's safer because the acid proof (not merely acid resistant) construction avoids danger of leakage, reduces hazards to employees and property. Once installed, chemical stoneware equipment lasts indefinitely and will not deteriorate. It is easy to keep clean and, when clean, cannot contaminate products handled.

Write for new complete bulletin



A Switch in Time Saves—

By switching to POWELL Iron Body Valves wherever they will serve as effectively as bronze, you will help conserve these critical metals

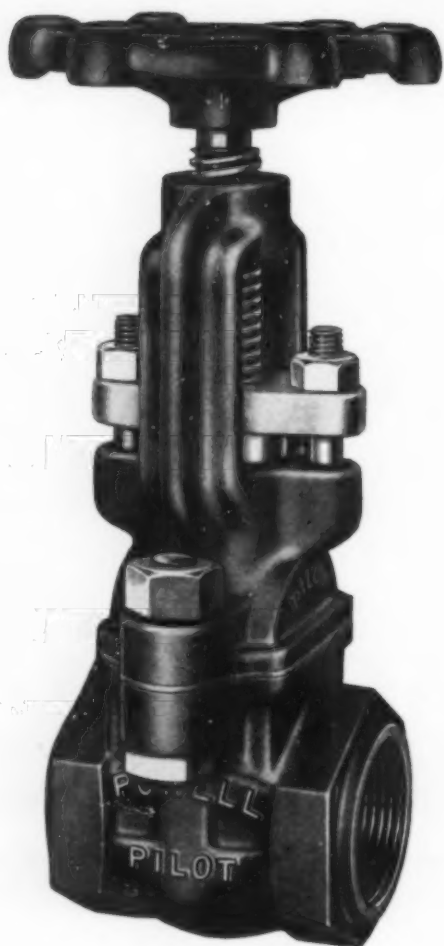


Fig. 480—All Iron "Pilot" Gate Valve. Screwed ends, outside screw rising stem, bolted flanged yoke, taper wedge solid disc. Made in sizes $\frac{1}{2}$ " to 3" inclusive, for 125 pounds W. S. P. Also available with Iron Body Bronze Mounted—Fig. 478.

Before the war made copper and tin virtually "precious metals," many buyers and users of valves automatically thought in terms of bronze. Apparently the impression existed that the desired service could be obtained only by using valves with bodies made of this alloy.

But now the necessity for conserving the more critical non-ferrous metals has brought the realization that iron body valves — especially Iron Valves by POWELL — will in many installations serve just as effectively as bronze.

So when you specify POWELL Iron Valves you not only render a patriotic service but, because of the lower priority rating required, you can expect earlier delivery and—YOU'LL HAVE SAVINGS TO INVEST IN WAR BONDS.

The Wm. Powell Co.

Dependable Valves since 1846

Cincinnati, Ohio

POWELL

COPPER *and* TIN

Fig. 1460—Iron Body Bronze Mounted "Master Pilot" Gate Valve, with screwed ends, rising stem, bolted bonnet and taper wedge solid disc. Made in sizes $\frac{1}{4}$ " to 2" for 150 pounds W. S. P.; $2\frac{1}{2}$ " to 4" for 125 pounds W. S. P. Also available in All Iron—Fig. 1462.

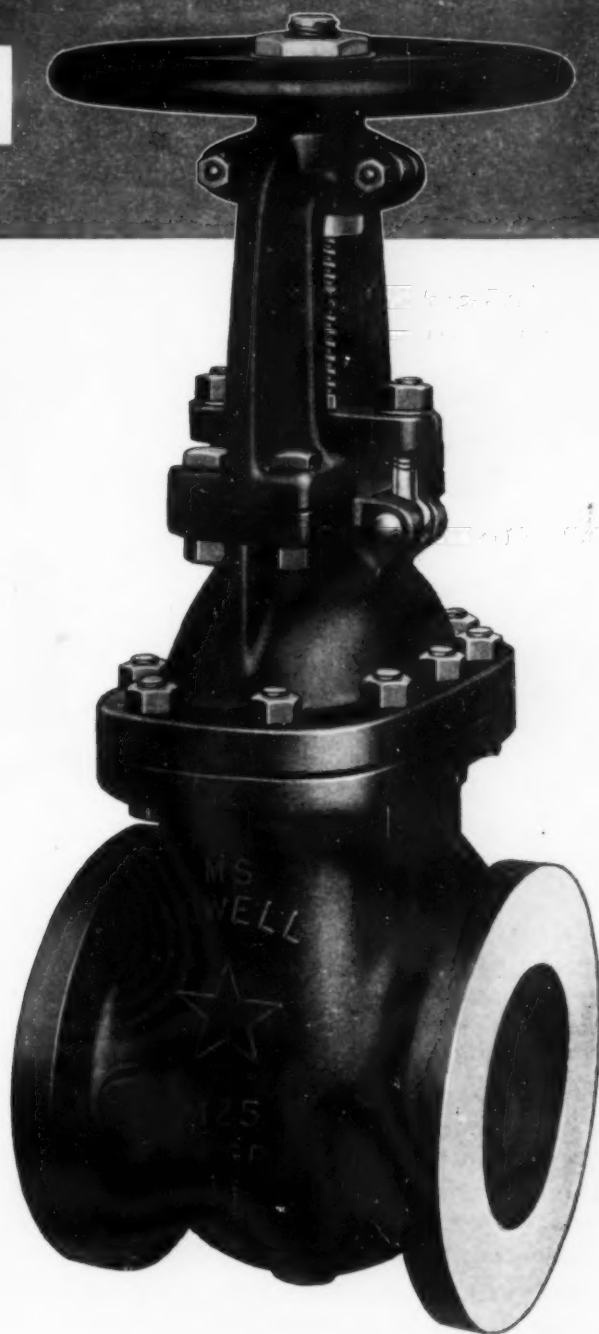
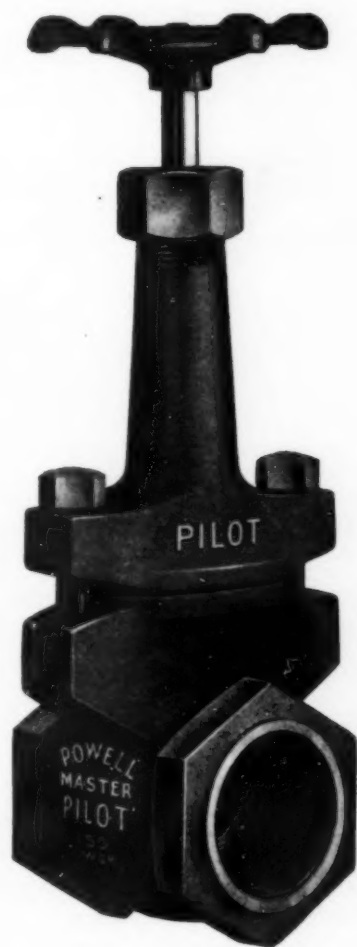


Fig. 1793—Iron Body Bronze Mounted "Model Star" Gate Valve, with flanged ends, outside screw rising stem, bolted flanged yoke, bronze renewable seat rings and taper wedge solid disc. Sizes 2" to 30". Available with taper wedge double disc (Fig. 1444) in sizes 2" to 12". Also made in All Iron—Fig. 1453 with double disc; Fig. 1816 with solid disc.

VALVES

Son...



HE has just turned eighteen. Shaves twice a week and maybe a hair or two is sprouting on his chest. He shies away now when his dad tries to be affectionate and we noticed some lipstick on one of his handkerchiefs after a country club junior dance not so long ago. But it seems only yesterday, perhaps it was the day before, that he was a chubby legged kid swinging from the arch of the doorway, leading to the dining room, in a gadget that was something like a breeches buoy and he was sucking at the end of a turkey bone.

He went back to school this Fall, a tall, athletic lad, budding into manhood, but there was something else on his mind beside the football and hockey teams or the little blonde girl with whom he had "palled" around during the Summer. It seems as though he was listening for a certain call—the Clarion call that poets sing about—and, perhaps we just imagined it, but we thought we saw an upward jutting of his chin, a certain light in his eyes, and a sort of a rearing-to-go expression in his face.

It chilled us a bit in the region of our heart, when we thought of his discarding the sports coat for the "O.D." of the Army or the blue of the Navy. There

was a bit of a catch in our throat as we thought of his putting aside his football helmet for one of steel; of his hanging up his hockey stick and reaching for a gun. After all we still regard him as just a little boy.

They tell us that the eighteen and nineteen year old lads are to be called to the service. When that day comes to us there will be prayers, but no tears. We shall not mourn nor shall we be fearful. Rather there will come welling up from our hearts that warm feeling of pride that millions of other parents will sense when their beloved lads marched away. Our lad is no different than the others. We are no different than other loving parents, nor is our sacrifice any greater. They are going to make great soldiers, sailors, marines and fliers out of these youngsters. And they will become a mighty force when they take their places beside their brothers in arms. They too know what they fight for. They too know full well of the sacrifices that must be made before the evil powers that threaten the world can be overcome.

And let us not forget that they are counting on us. They know that we shall not fail them.

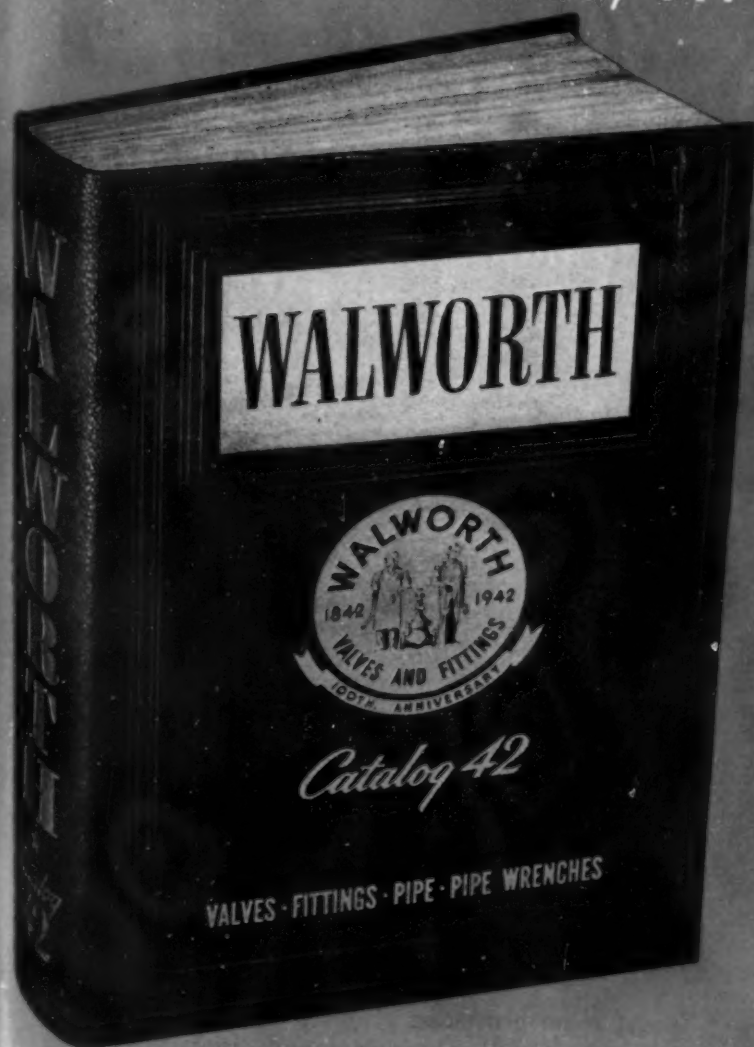
God be with them and their brothers.

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

REG. U. S. PAT. OFF.

Specify **FROM THE NEW WALWORTH Catalog 42** *and be sure!*

HERE'S THE COMPLETE UP-TO-DATE DATA
ON VALVES, FITTINGS AND PIPE



1. **METALS** — complete data on all types used including conformity with A.S.T.M., Marine and U. S. Navy specifications.

2. **PRESSURES**—working and test pressures; plus service recommendations.

3. **DIMENSIONS**—complete for layout and operation with cross sections to clarify internal construction.

4. **ENGINEERING DATA** — charts, tables, formulae to make valve and pipe installations easier.

5. **TELEGRAPHIC CODE**—carefully indexed to simplify and speed up accuracy in specifying.

Your new Walworth Catalog 42 is off the press. Clearly indexed and detailed so as to be most useful, it gives the last word on any question concerning our products.

Priorities on transportation may delay the receipt of your copy but we are doing everything possible to expedite delivery.

WALWORTH

WALWORTH COMPANY
60 EAST 42nd STREET, NEW YORK

VALVES
FITTINGS
and TOOLS

Backed by 100

DISTRIBUTORS IN PRINCIPAL
CENTERS THROUGHOUT THE WORLD

Reproduction of photo-mural, as shown in the Cleaver-Brooks offices, depicting representative Oilbilt steam plant installations.



The Cleaver-Brooks Principle of Oil-Fired Steam Generation . . . Finds a Vitally Important Application in Equipment for Our Fighting Forces



Reproduction of photo-mural which is a composite illustration of various types of Cleaver-Brooks equipment built for our armed forces.

Known for their efficient application of the multi-pass, down-draft heating principle, Oilbilt steam plants are providing steam for power and processing in hundreds of industrial establishments — helping them to meet record-breaking production schedules for war equipment.

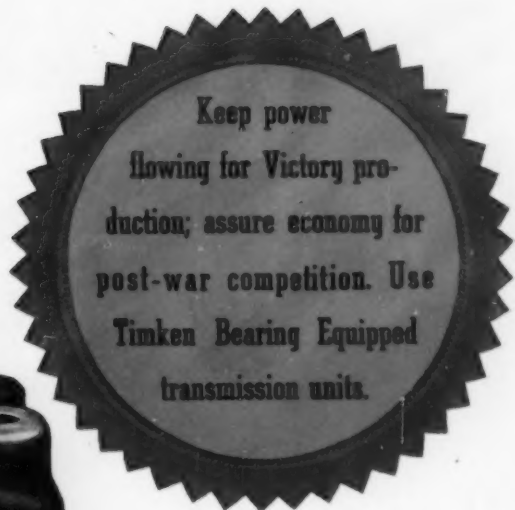
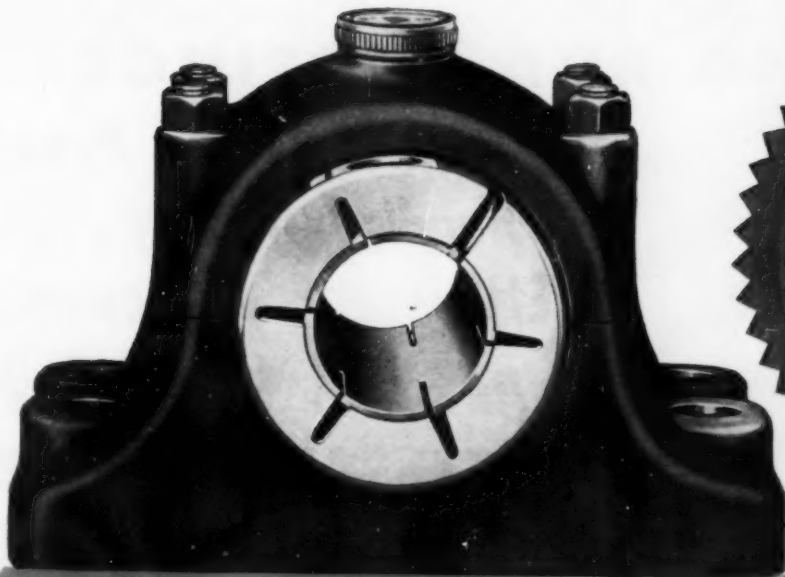
Mobile equipment, employing the same proven principle of firing with America's ideal fuel — oil — and including hot water heating equipment,

special steam generating plants, portable shower bath units, distilling, sterilizing and disinfecting equipment, is contributing to the safety and comfort of our fighting forces wherever they are located.

Now manufactured for a nation at war, Cleaver-Brooks products will resume their peacetime service when Victory day comes.

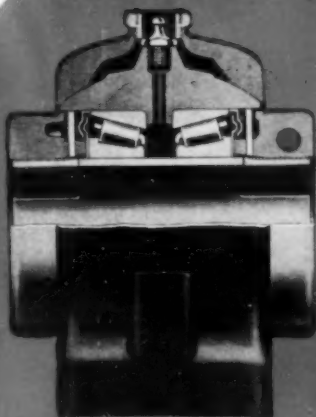
CLEAVER-BROOKS COMPANY
5108 North 33rd Street • Milwaukee, Wisconsin

CLEAVER-BROOKS COMPANY • MILWAUKEE, WISCONSIN



Keep power
flowing for Victory pro-
duction; assure economy for
post-war competition. Use
Timken Bearing Equipped
transmission units.

Dodge-Timken D-T Clamp
Sleeve Type Pillow Block.



Section of Dodge-Timken D-T
Clamp Sleeve Type Pillow Block
showing the application of
Timken Bearings.

Obsolete, friction-ridden pillow blocks and line shaft hangers are responsible for many involuntary power interruptions and consequent production shutdowns.

They are difficult to keep lubricated properly, are subject to burning out and reduce shaft life through wear. Furthermore, a considerable percentage of the power transmitted through them is lost enroute—burned up by friction.

All these disadvantages are permanently overcome when modern Timken Bearing Equipped units are used. There is no friction to waste power; lubrication is needed only at long intervals, for once put in, the lubricant *stays* in; the same effective bearing closures *keep dirt out*. And because all movement takes place within the bearings themselves, there is no wear whatsoever on shafts.

Loads of all types—radial, thrust or both together—are adequately taken care of by the geometrical design of the Timken Bearing and its precise, sturdy construction.

Check up on your power transmission equipment now and replace the undependable power wasters with modern dependable power savers.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

HELP ASSURE VICTORY

Buy War Bonds. Conserve Rubber. Eliminate Unnecessary Travel. Use the Telephone Only When Important. Salvage All Scrap and Waste Material.



WELDING ROD COATINGS...

*Difficult Mixing Problems
Handled Quickly...*

Efficiently... Economically

with **SIMPSON**

INTENSIVE MIXERS

HIGH-SPEED welding is speeding war production — in building ships and tanks and in fabricating operations on countless other pieces of armament.

Today's rapid and efficient welding techniques would not be possible without uniform welding rods — rods with coatings to protect weld metal from oxidation and gas absorption . . . coatings that make smooth, clean surfaces . . . sound welds that require no chipping out for rewelds.

Thorough and uniform mixing are essential in compounding a welding rod flux—the mix must be of a closely controlled consistency for speedy and precise application of flux to core wire by modern extrusion presses.

Repeat orders for Simpson Intensive Mixers by welding rod manufacturers are conclusive proof of successful solution of this difficult mixing problem. This is just one of many examples of critical mixing applications successfully mastered by Simpson Intensive Mixers. Write for complete information, or call a National engineer to work with you on your mixing problem.



• The mixer shown here is equipped with 1600 lb. mullers and special scrapers for handling welding rod coatings. Its mixing action is comparable to the rubbing, kneading and smearing action of mortar and pestle. Mullers, muller scrapers and plows revolve in a circular, stationary pan. Mullers are mounted on rocker arms, free to float on material being mixed. They create pressure and an intensive rubbing action as they revolve, but do not grind. Scrapers remove the mix from the mullers, dropping it back to the pan floor for continued mulling. Plows exert a shoveling action to the material being mixed, turning it over upon itself and directing it in front of the mullers.



NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING • CHICAGO, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries:—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Extending Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia



From Design
to Operation

BLAW-KNOX
builds complete
PROCESS PLANTS



Research, engineering, fabrication, erection, initial operation—all under single guarantee and single responsibility. For complete new plants or additions—let Blaw-Knox do the whole job!

BLAW-KNOX DIVISION OF BLAW-KNOX CO.

2090 FARMERS BANK BLDG., PITTSBURGH, PA.

Offices in Principal Cities

Complete plants or equipment for the following processes...

| | | |
|--------------------|---------------------|-------------------|
| Distillation | Kilning and | Organic Synthesis |
| Gas Absorption | Calcining | Emulsification |
| Solvent Extraction | Polymerizing | High Pressure |
| Solvent Recovery | Evaporation | Processing |
| Heat Transfer | Crystallization | Impregnating |
| Furnacing | Drying | Gas Cleaning |
| Cracking | Mixing and Stirring | and others |

DID YOU EVER PULL THE TRIGGER

ON A TEST TUBE?



THE test tube is a mighty weapon in this war. It is the birthplace of strategic materials America must have to win.

But the contents of a test tube mean little until the results of the experiments are put into full-scale production. That takes time—and wars won't wait.

In the vital chemical and petroleum industries today, Badger is helping to cut down the precious time required to turn the findings of the test tube into a completed, working plant.

Badger directs the process all of the way—from the first blueprint to the first blow of the whistle! With its large staffs of engineers, chemists, draftsmen, designers and construction workers, Badger gives the unified, co-ordinated effort that speeds production.

Today, with our nation fighting for its very existence, Badger is serving the petro-chemical industries—building plants and equipment for the manufacture of T.N.T., butadiene, alcohol, aviation gasoline, and many other critical war materials. Tomorrow, when the peace is won, Badger will help convert the miracles of wartime test tubes into a greater service for a greater America.

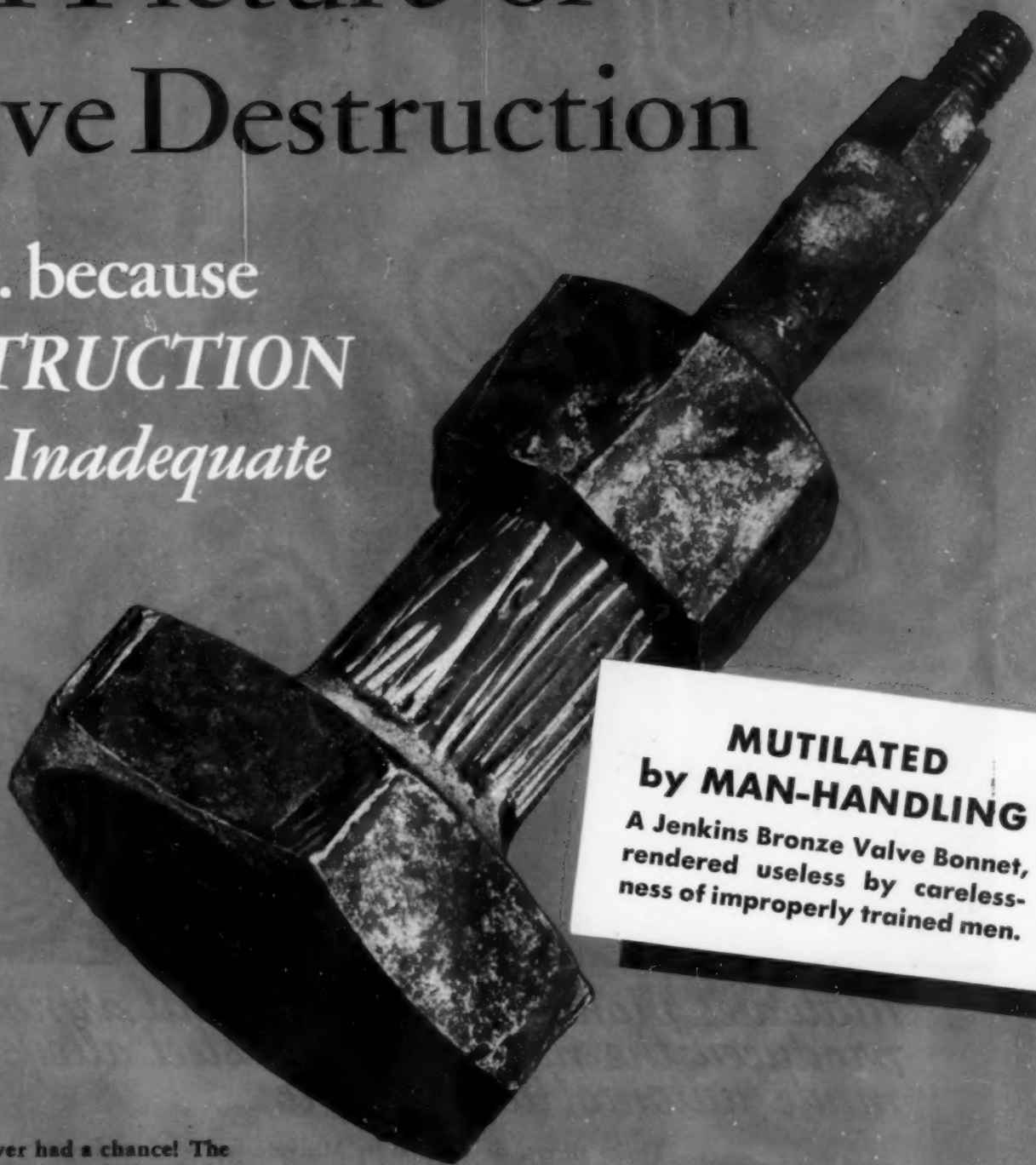
E. B. Badger
AND SONS COMPANY
BOSTON EST. 1841

NEW YORK • PHILADELPHIA
SAN FRANCISCO • LONDON

PROCESS ENGINEERS AND CONSTRUCTORS FOR THE PETRO-CHEMICAL INDUSTRIES

A Picture of Valve Destruction

...because
INSTRUCTION
was Inadequate



THIS valve never had a chance! The neck of the bonnet is crushed, and the threads within distorted, rendering the spindle inoperative. Some heavy-handed workman applied a pipe wrench to the neck when trying to loosen the packing nut, which had been improperly turned down (with a wrench) so tight that it jammed.

Had the packing nut been turned down properly (*finger-tight only*), it could have been removed easily with a hexagon wrench without touching the neck of the bonnet. The damage could have been avoided, and the bonnet preserved for many more years of service. No wrench of *any* kind should ever be used on the bonnet neck!

Since bronze is one of the scarcest of the critical metals, and bronze valve parts almost unobtainable, careless de-

struction of this kind must be prevented.

Install valves properly...inspect them regularly...replace worn parts before deterioration occurs...instruct new workmen thoroughly. This four-point program will reduce slow-downs due to valve failure, and help keep vital war production ahead of schedule.

Jenkins Engineers will give you any help you need in organizing your program of valve conservation.



JENKINS BROS., 80 White St., New York, N. Y.; Bridgeport, Boston, Adams, Philadelphia, Chicago, Houston. Jenkins Bros., Limited, Montreal, London.



JENKINS VALVES

For every industrial, engineering, marine and power plant service... in Bronze, Iron, Cast Steel and Corrosion-Resisting Alloys... 125 to 600 lbs. pressure.



Midvale's pioneer work on Naval armor plate produced the nickel chrome steel alloys which made automobiles possible

These alloys, developed by Midvale for war, made possible the tremendous peacetime growth not only of the automobile industry, but, through it, of our whole national mode of living and thinking. For, if automobiles had been forced to rely on the carbon steels that built the railroads, the size and weight of all parts to secure required strength would have been prohibitive. Similarly, the work being done today at Midvale is promise of greater growth, undreamed-of possibilities—tomorrow.



THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA, PA.
OFFICES: New York • Chicago • Pittsburgh • Washington • Cleveland • San Francisco

MIDVALE



Why the **CONCAVE SIDE**
Cuts Belt Costs!

**What Happens
When a
V-Belt Bends**



FIG. 1



FIG. 2

If you care about belt costs, pick up any V-belt you have handy and make this simple test:—

Bend the V-belt while you grip its sides and you will feel how the belt changes shape. The top, under tension, narrows. The bottom widens. The sides of the belt bulge out. Clearly, if its sides were straight to begin with, the bent belt is forced into a shape that does not fit the sheave groove—as shown in figure 1, on the left.

Now, bend a V-belt built with the patented Concave side. You get the same shape change, but now the new shape exactly fits the sheave groove—as shown in figure 2. There is no side-bulge. Results? (1) Uniform side-wall wear—longer life! (2) The belt gets a full side-width grip on the pulley—carries heavier loads without slippage. This cuts belt costs and saves power.

Only belts built by Gates are built with the Concave side, which is a Gates patent.

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

Chicago, Ill.
549 West Washington

New York City
215-219 Fourth Avenue

Birmingham, Ala.
405 Liberty National Life Bldg.

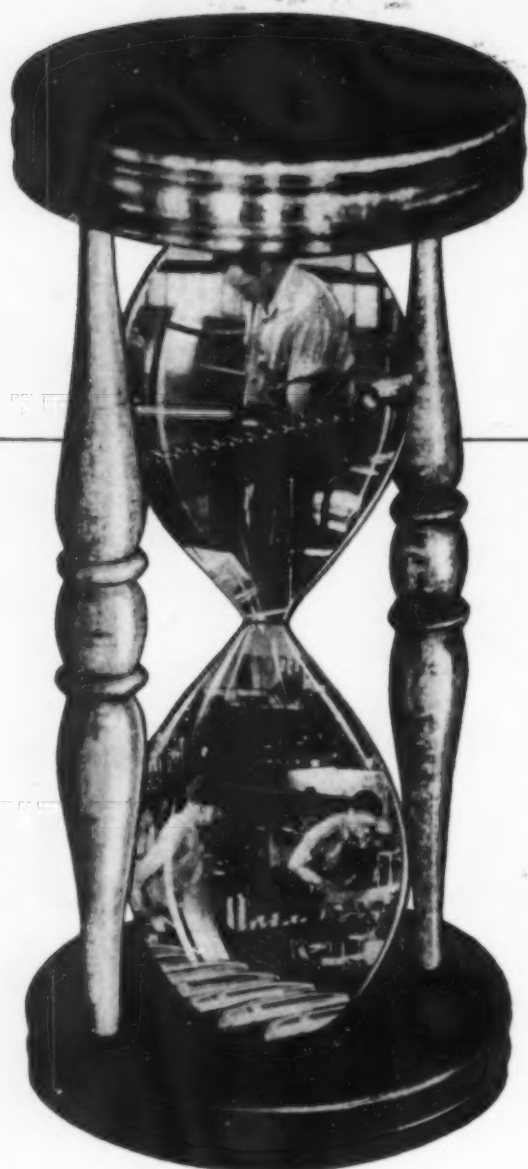
Los Angeles, Cal.
2240 East Washington Blvd.

Denver, Colo.
999 South Broadway

Dallas, Tex.
2213 Griffin Street

Portland, Ore.
333 N. W. 5th Avenue

San Francisco, Cal.
2700 16th Street



Protect Time against Fire

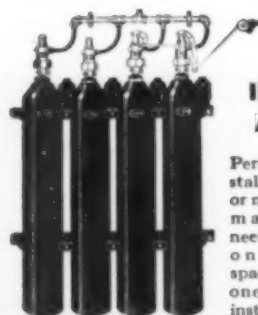


While your production soldiers are straining to make every hour count, it's your responsibility to protect production time against loss of time. A devastating fire could stop production, destroy materials and shut down a plant. Even a small fire may cause enough damage from water and axes to make a plant non-productive for months.

Industries that use flammable chemicals, highly volatile, explosive liquids; factories with bake ovens, spray rooms, dip tanks; plants with transformer vaults, motors, dynamos and other electrical equipment—all industries that use machinery or materials which in the event of fire could be put out of production by the usual fire extinguishing methods, should know about C-O-TWO.

IT'S SAFER *because* IT'S FASTER

C-O-TWO automatic and manual systems, portables and fixed hose units extinguish fires in split seconds with carbon dioxide, one of the fastest fire extinguishing agents. By shutting off the oxygen with a sub-zero blanket of fire-killing gas, C-O-TWO annihilates fire in a matter of seconds—and *without damage to machinery or materials*. If there is a chance that a fire would cause you the loss of even an hour's time, you owe it to yourself to learn how C-O-TWO can give you added fire protection.



INSTANT ACTION

Permanently installed automatic or manual system may be engineered to protect one or more spaces from the one C-O-TWO installation.



QUICK AS THE WIND

With C-O-TWO hand and wheeled type portables, carbon dioxide is directed at the base of the fire, killing the fire—without damage—in seconds.



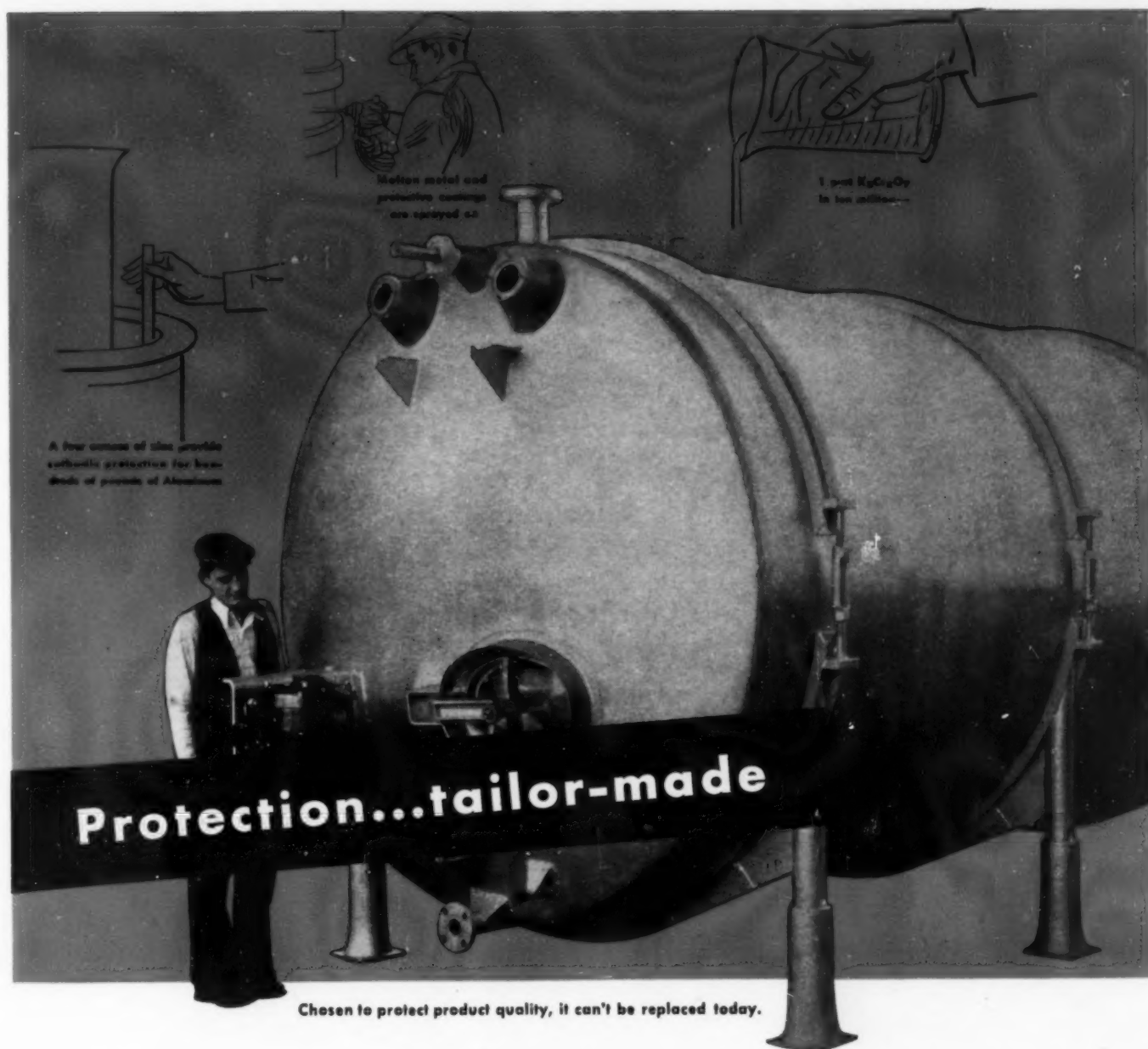
FOR FAST KNOCK OUT

In laboratory or bench fires, these small, fast acting 4, 10 and 15 pound cylinders of C-O-TWO carbon dioxide gas kill fires almost instantly.

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK, NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada



HOW to make Aluminum Alloy processing equipment last longer than its "economic life"... HOW to head off "normal depreciation"... HOW to carry on through the emergency when replacement materials aren't available. There's undoubtedly an answer to each of these problems, but it has to be tailor-made to suit your conditions.

We'll gladly help you solve these problems.

If you can anticipate attack by the materials being processed, cathodic pro-

tection may stop this attack or slow it down considerably. Protective coatings may do the same. Corrosive coolants can often be deprived of their kick by the addition of inhibitors. If parts are worn or eaten thin, they can be built up by spraying on molten metal.

Here's your chance to profit by the years of research which Alcoa engineers have carried on. Tell your troubles to ALUMINUM COMPANY OF AMERICA, 2151 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA  **ALUMINUM**

USEFUL CORROSION DATA

*Comparative data assumes new importance
in selection of substitute materials*

For many applications requiring corrosion-resistant materials, strategic alloys are no longer available. Users must therefore resort to the less restricted metals.

In this situation, the Technical Service Division of International Nickel, welcomes the opportunity to be of service.

Even though your problem may not be concerned with Nickel or its alloys, you are invited to utilize information in Inco corrosion data files.

Much of this information has been gathered by Inco Development and Research men as a result of corrosion tests carried out in various plants under actual operating conditions. It applies not only to Nickel Alloys and other corrosion-resisting materials, but also to other metals, including ordinary iron and steel.

These data, together with assistance in interpreting them with respect to your own problems are available without obligation. For information and assistance please address the Technical Service Division.

The International Nickel Company, Inc.

67 Wall Street, New York, N. Y.

FROM THE MEN OF CLARK BROS.
to Free Men Throughout the World



*A
Christmas Message*

On this Christmas Day we of Clark Bros. Co. extend greetings to the fighting men of all the United Nations, ashore and at sea, at home and abroad.

We want you to know that our thoughts, our hopes and our prayers are with you today, guiding our actions and spurring us on to meet cheerfully any demands that may be made upon us.

Above all else, we ask you to accept this solemn promise: Never for a moment shall we at home lose sight of the obligation that we owe to those on the firing line. Collectively and individually we pledge ourselves never to let you down by letting up in our production of the materials you need to wage a winning fight.

With you we look forward to a happier Christmas in the not too distant future. And like you we believe that the more energetically we fight this war, the quicker the return of the kind of holidays we used to know... The Men of Clark Bros. Co., Inc., Clark, N.Y.





Ever hear of boiling water in paper?

YES, in the research laboratories of Union Bag & Paper Corp. even that's been done! But manufacturers will have less interest in this experiment than in the fact that the South's abundant pulpwood supply is able to furnish kraft papers for thousands of uses...accomplish tasks once deemed impossible for paper to perform.

WITH MULTI-WALL CONSTRUCTION, Union Bag & Paper Corp. offers highly

efficient methods of packaging and shipping agricultural, chemical, fertilizer, food and rock products...affords a decided weight and space-saving advantage.

IN THE FIELD OF WAR PACKAGING,

Union Bag & Paper Corp. is able to make kraft papers resistant to oil, grease and water, super-strong, non-scuff, flavor-sealing, fold-enduring, and eye-appealing...is able to make kraft containers that have one, or ALL of these important advantages.

Whatever your wartime container or package problem... no matter how difficult it may seem...consult

**UNION BAG
& PAPER CORP.**

WOOLWORTH BUILDING, NEW YORK, N. Y.

KRAFT PAPER—THE SERVICE UNIFORM OF AMERICAN PRODUCTS



DON'T DO THIS TO YOUR VALVES!



Don't use a long lever and strong pull on any screwed joint, either. Avoid twisting the valve, by using a short lever and a few hammer taps.



At no time permit anyone to use a wrench on the valve hex farther from the joint. Valve bodies are strong but they are not designed to withstand that sort of strain. A twisted body—and a valve that will not operate—may very well be the result. . . . Remember, high pressure war production and allocation of critical metals have combined to make it difficult to get new valves. Guard those that you now have.

READING-PRATT & CADY

MANUFACTURERS OF

CAST STEEL VALVES • BRASS AND IRON VALVES • D'ESTE ENGINEERING SPECIALTIES

Reading, Pa., Atlanta, Boston, Chicago, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco

A Division of AMERICAN CHAIN & CABLE COMPANY, INC. Bridgeport, Conn.

This Simple Care **ADDS YEARS OF LIFE** **TO STAINLESS STEEL EQUIPMENT**

Certainly, stainless steel is tough and strong. It resists hard wear and abuse—resists corrosion and oxidation. Normally, it will last longer than most other materials—even in the most severe service.

And it could last even longer—if certain precautions were taken and care exercised in cleaning.

Are you doing everything possible to get every available day of service from your stainless steel equipment? Remember—when your present equipment is worn out, you probably will not be able to replace it during wartime, unless you have an extremely high priority.

Here's what to do. Write and tell us the

nature of your operations, and we'll send you a poster-size wall card (several if you need them) giving suggestions for lengthening service life and detailed information on cleaning. Individual cards are available for the various types of equipment listed on the opposite page.

This information—prepared by Republic metallurgists from their *UNEQUALLED* experience in the development and application of Republic ENDURO* Stainless Steel—may be the means of adding years to the life of your priceless equipment.

REPUBLIC STEEL CORPORATION

Department CM

Alloy Steel Division

Sales Offices • Massillon, Ohio

GENERAL OFFICES • CLEVELAND, OHIO

Berger Manufacturing Division • Culvert Division
Niles Steel Products Division • Steel and Tubes Division
Union Drawn Steel Division • Truscon Steel Company
Export Department: Chrysler Building, New York, N.Y.

*Reg. U. S. Pat. Off.



TO ENDURO FABRICATORS: *Tell us how many of these conservation cards you would like for distribution to your customers. We'll gladly furnish them already imprinted with your name and address.*

REPUBLIC *Enduro*

Other Republic products include Steel and rust-resisting Toncan* Iron Pipe, Sheets and Roofing—Upson Bolts,

CONSERVE STAINLESS STEEL
Process and Chemical Equipment
IT'S EASY . . . HERE'S HOW

Americ ENDURO Stainless Steel is the nearest approach to the perfect metal for equipment in many industries. It withstands corrosive attack and wear far better than other materials. Proper care requires only a little time. Give your stainless steel the best care and you will be repaid in maximum service life.

Longer Service Life.

Acids, alkalis, bromides, chlorides, sulfuric acid, etc., especially at elevated temperatures.

REPAIRS ARE EASY * * * HERE

Follow These Suggestions for Longer Service Life

- ## Follow These Suggestions
- 1 **Consultation is of utmost importance.** This cannot be overemphasized. The service men at **Howe in Great Enduro** below, can be contacted or visited by mail, telephone, or in person. If that is not possible, your long correspondence with the metal and clean company.
 - 2 **Use the chemicals you already are recommended for** with stainless steel. Public Steel Corporation has published a list of acids, cleaners and acids, showing their effect upon stainless steel. If you do have a copy, write this list down.
 - 3 **Use the chemicals you already are recommended for** with stainless steel. Public Steel Corporation has published a list of acids, cleaners and acids, showing their effect upon stainless steel. If you do have a copy, write this list down.
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- ... **ENDURO STAINLESS STEEL EQUIPMENT** ...
Reactions to Stainless Steel

[illegible]

- [illegible]

THESE SUGGESTIONS
INTERESTS OF CONSERVATION
REPUBLIC
Ohio

General Offices - Chicago

AND BY YOUR EQUIPMENT FABRICATOR IN THE
MATERIAL. PLEASE POST IN A CONSPICUOUS PLACE.

RPORATION
Heavy Steel Division Sales Offices-

Individual cards
are available for the
following types of equipment:

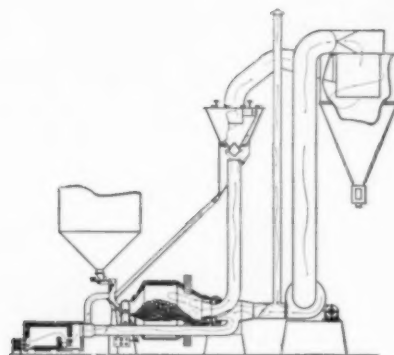
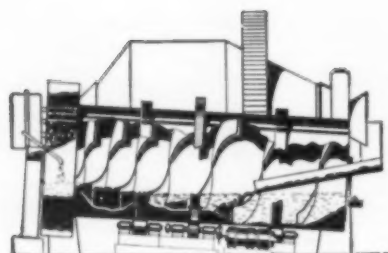
PROCESS AND CHEMICAL
•
PULP AND PAPER
•
FOOD AND BEVERAGE
PROCESSING
•
FOOD HANDLING
AND SERVING
•
TEXTILE
•
DAIRY

STAINLESS STEEL

Nuts and Rivets—Electrunit* Condenser and Heat Exchanger Tubes—Berger Lockers and Shelving

Wet versus Dry Grinding

A Few Facts Most Mill Users Do Not Know!



1. Do you know that power to grind wet is less than to grind dry but this advantage may be more than offset by the very low ball and liner consumption of the same mill grinding dry?
2. — or that you can secure a better graded product when grinding dry?
3. — or that you can dry and grind simultaneously?
4. — or that if the product is to be acid treated, leached, or if water is scarce, dry grinding may be preferred?
5. — or that some physical or chemical action grinding dry has, in many cases, increased extraction?
6. Do you know that when grinding wet, in closed circuit with the Hardinge Counter-Current Classifier, you have a positive control of your fineness and that the Classifier maintenance is next to nothing?
7. — or that a short cylinder Conical Mill grinding either wet or dry eliminates dead zones, thus increasing grinding rate and insuring a close control of sizing.

Write for Bulletins 13-D, 39 and 41

HARDINGE
COMPANY, INCORPORATED — YORK, PENNSYLVANIA
New York, 122 East 42nd St. Chicago, 205 West Wacker Drive, San Francisco, 501 Howard St.
Toronto, 200 Bay St.



He'll live!...to fight again

IN THE oil-slicked waters of a darkened sea, one of our fighting airmen is forced down. Miles from nowhere—nothing more than a dot on a limitless expanse of ocean—the pilot's life could well be despaired of, were it not for the swift rescue boats whose ever-watchful patrol saves valuable fighting men to fight again.

These crash boats are ready for any emergency, and their ability to get there—in a hurry—is both a tribute to their sleek design and to the highly efficient engines which power them. Behind the whirling propellers which speed these craft through the water are gears—Foote Bros. gears of such extreme precision that until a short time ago, they were considered a laboratory product.

But engines for rescue boats and torpedo boats—engines for fighters, bombers and aerial freighters, called for gears in such quantities that only mass production methods could supply the demand.

And today these "jewels of power transmission" are flowing out in ever-increasing quantities to speed America's fighting forces—in the air and on the waves—to Victory.

The new manufacturing techniques, and new ways of coupling extreme precision with mass production developed in the plant of Foote Bros. mean more and better aircraft and marine engines. These same lessons applied to the world of tomorrow will mean better machines, more compact and more efficient machines produced at costs that promise greater savings to America's manufacturers.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5301 South Western Boulevard
CHICAGO

FOOTE BROS.

Better Power Transmission Through Better Gears

FARWELL METAL FABRICATING DIVISION

FARWELL, OZMUN, KIRK & CO.

ST. PAUL, MINN.



A MODERN,
COMPLETELY EQUIPPED PLANT—
SERVING
INDUSTRIALS, FOOD, CHEMICAL,
PROCESS AND ALLIED
INDUSTRIES.
GENERAL SHEET METAL WORK,
STAMPINGS, DIE MAKERS

Mr. Manufacturer:

Farwell's modern, completely equipped plant, offers the services of its engineers and craftsmen in the production of your ideas in metal, the costs kept in line.

B U T N O T N O W

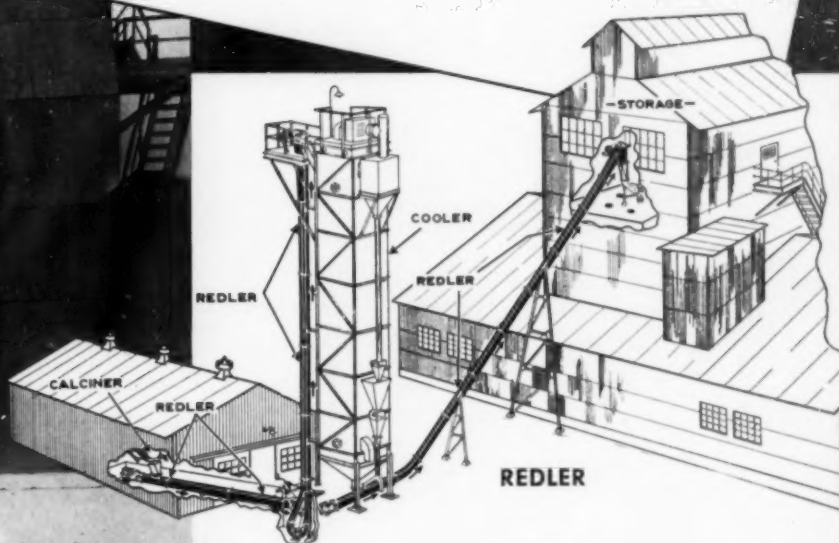
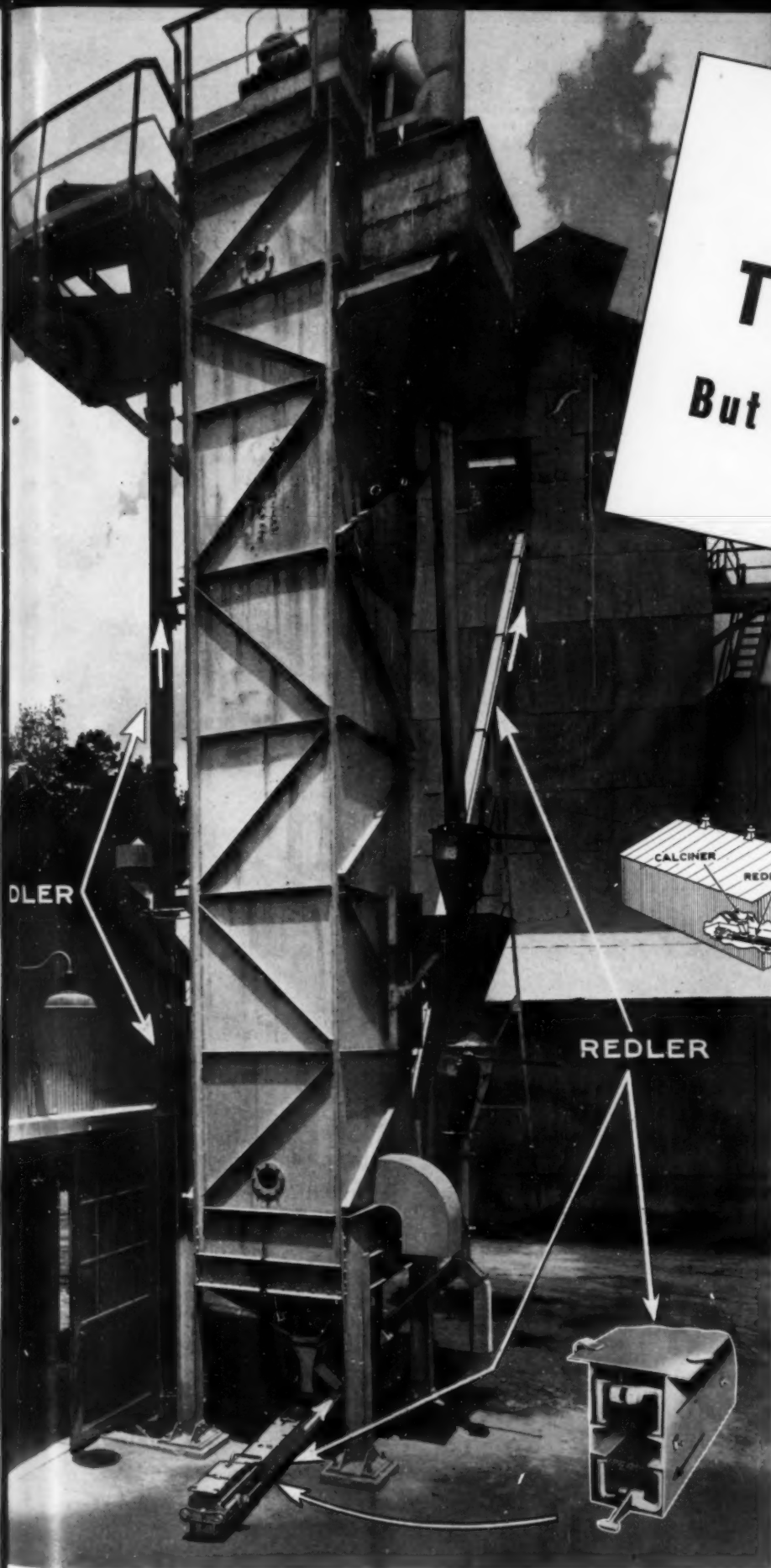
We are sorry, but at the present time and for the duration, our entire factory and facilities are engaged in all-out war work.

However, this plant is so easily convertible into service for you, that we will be one of the first to be able to fill your orders after the war is won.

Sincerely,

FARWELL METAL FABRICATING DVSN.
Farwell, Ozmun, Kirk & Company

**TOO HOT
TO HANDLE**
But REDLERS Handled It



A filtering material in bulk, at 1100° F, presented a unique and special problem for conveying equipment. The reputation for remarkable versatility won by numerous Redler installations, resulted in a call to "S-A".

The diagram shows how Redler equipment was adapted to the job with casings of special steel qualified to stand the temperature. The enclosed moving stream of hot material from the calciner is conveyed by a horizontal Redler to another of the loop boot type. This makes a vertical lift to the top of the cooling tower. Again at the base of the cooler, horizontal-inclined Redler carries the cooled material to storage.

The adaptability of Redler equipment to special requirements is well illustrated in this case. The same compact, dust-tight mechanism will convey practically any pulverized, flake and small lump material, with a wide range of speeds and conveying circuits.

STEPHENS-ADAMSON MFG. CO.

3 Ridgeway Avenue, Aurora, Illinois
Los Angeles, Cal.

Belleville, Ont.

STEPHENS-S-ADAMSON

MFG. CO.

Chains and Sprockets
Bin Gates

Belt Conveyors
Pan Conveyors

SealMaster

Bucket Elevators
Feeders

Crushers
Screens

Substitute for Scarcity

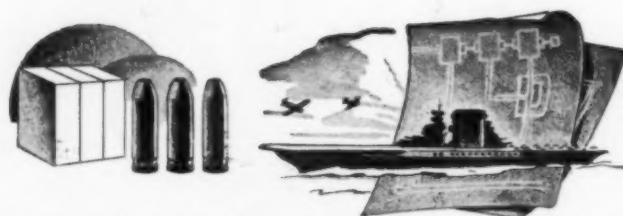


1939!

Nineteen thirty-nine! That was the year Hitler started on his romp through Europe. And that was the year Mathieson introduced *synthetic salt cake* to the kraft paper industry. October, to be exact. At that time shipments of ordinary salt cake from Europe, which had supplied about half the salt cake required for our kraft pulping operations, were cut off by the war. Except for the timely intervention of Mathieson Synthetic Salt Cake, which has since proved itself superior to ordinary salt cake, there might have been a serious dislocation in the kraft paper industry.



How serious the threatened dislocation might have been, no one knows. But the gravity of the situation has been high-lighted by subsequent reports on the importance of paper and pulp products in the war effort. "So vital is paper in waging war," an authoritative source states, "it is estimated that the present struggle would be forced to stop within 60 days if the supply of pulp and its many products were cut off."



Among those products are 60,000 tons of kraft paper, required to interleave armor plate and cold rolled steel . . . 30,000 tons of kraft to package shells and high explosives . . . and an entire carload of blueprint paper to design one modern aircraft carrier! All this in addition to thousands of tons of paper required for other wartime purposes—notably to package the "tools" of war and to record its innumerable decisions and directives, at home and in the field.



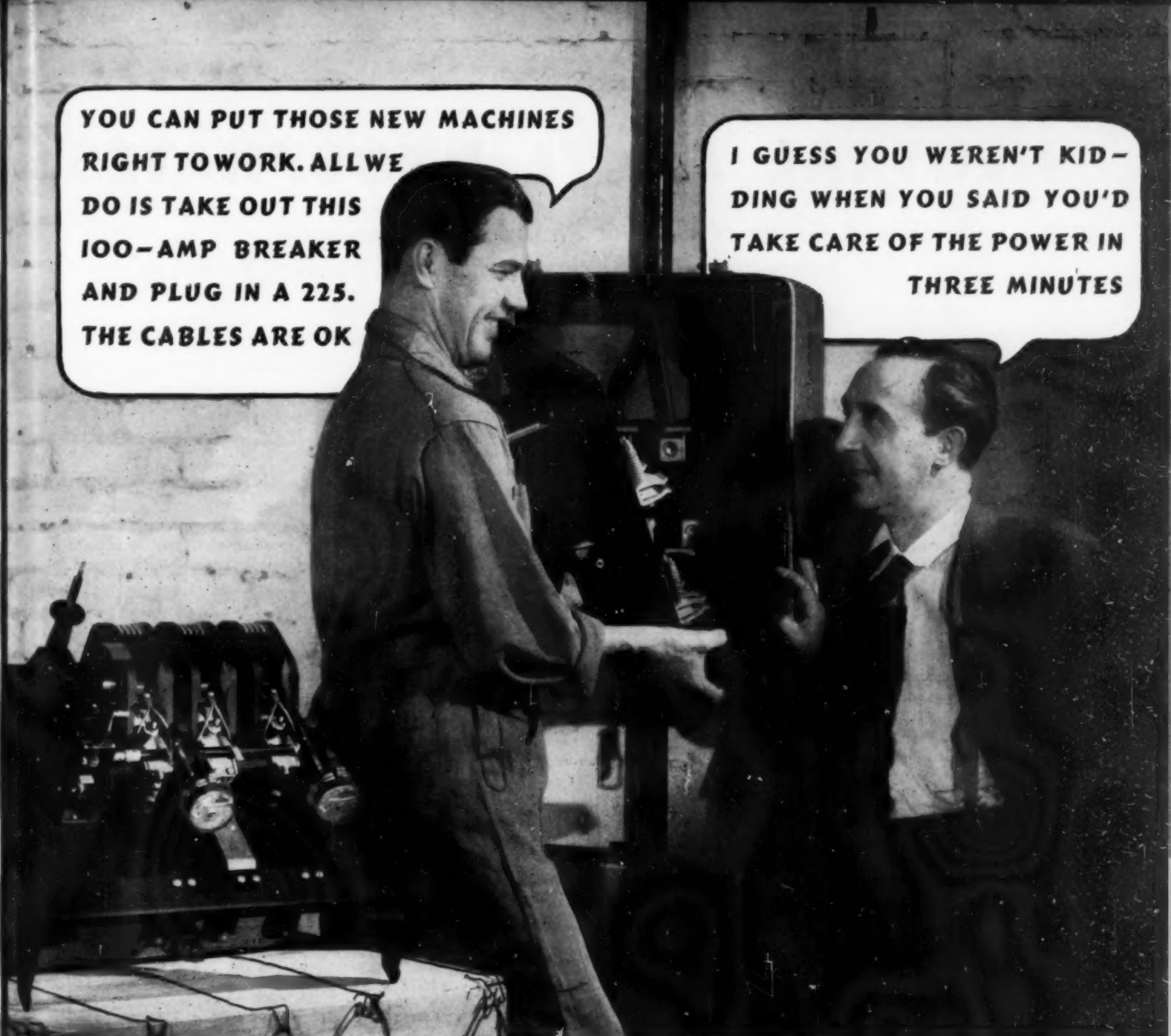
An exclusive Mathieson product, *synthetic salt cake* is but one of the many aids to American industry developed by Mathieson chemists and engineers.

Sodium Chlorite, another new Mathieson product, is widely used by the pulp and paper and textile industries as a bleaching and processing agent. And in Chlorine, Caustic Soda, Soda Ash and Ammonia, the Mathieson Alkali Works has made available not only to the paper industry but to all U. S. war industries four heavy-duty industrial chemicals that are vital to victory.

MATHIESON

CHEMICALS

THE MATHIESON ALKALI WORKS (Inc.)
60 East 42nd Street, New York, N. Y.
LIQUID CHLORINE . . . SODA ASH . . . CAUSTIC SODA
... BICARBONATE OF SODA . . . BLEACHING POWDER
... HTH PRODUCTS . . . AMMONIA, ANHYDROUS and
AQUA . . . FUSED ALKALI PRODUCTS . . . SYNTHETIC
SALT CAKE . . . DRY ICE . . . CARBONIC GAS . . . SODIUM
CHLORITE PRODUCTS.



YOU CAN PUT THOSE NEW MACHINES
RIGHT TO WORK. ALL WE
DO IS TAKE OUT THIS
100-AMP BREAKER
AND PLUG IN A 225.
THE CABLES ARE OK

I GUESS YOU WEREN'T KID-
DING WHEN YOU SAID YOU'D
TAKE CARE OF THE POWER IN
THREE MINUTES

Keep Up with Shifting Loads with This New Removable Breaker

WHEN plant loads grow rapidly and shift quickly—as they do today—your breaker capacity must keep in step. If it lags behind, shut-downs and loss of valuable production time soon catch up with you! That's another reason why we built this *removable* breaker, which permits interchanging different-rated breaker units—in *less than three minutes*—to meet new load conditions.

This new breaker is equally easy to

install, operate, and inspect. Because of its unique flexibility and its ability to quickly restore service after protective interruptions, it saves valuable minutes of production time daily. It protects against the damage and prolonged delays often caused when less adequate protective devices are subjected to severe short-circuits.

Install these new AE-1 breakers in your lighting, power, and motor circuits—up to 600 volts. A new

booklet (GEA-3600) tells how and shows where to use them. For a copy, write the G-E office near you, or address General Electric Co., Schenectady, New York.

THE BREAKER WITH THE DISCONNECT FEATURE

GENERAL  **ELECTRIC**

860-23-7500

KEEP THE POWER ON YOUR MACHINES
WITH G-E AIR CIRCUIT BREAKERS



NEUTRAL ALKYL PHOSPHATES

A Group of Organic Phosphorus Compounds That Offer Interesting Possibilities for Further Chemical Research

The organic phosphorus compounds are much less familiar in the industrial field than the inorganic phosphorus compounds. The last few years, however, have witnessed a marked increase in research on the former . . . on the alkyl esters of phosphoric acid in particular. The result has been that many interesting applications have already been suggested. Among them are the following:

Plasticizer in cellulose acetate, in organic acid derivatives of cellulose, and in synthetic resins of the phenol-aldehyde type.

Waterproofing textiles with cellulose acetate.

Accelerators for curing urea-formaldehyde resins.

Polymerizing agents for unsaturated hydrocarbons, drying oils, resins, etc.

Catalysts for the dehydration of glycols and olefinic alcohols to diolefins such as butadiene.

Absorbing fluids in refrigeration systems.

Leveling liquids in printing compositions for vat dyes.

Corrosion inhibitors for gun barrels, bearings of meters and compressors, etc.

Properties of the Neutral Alkyl Phosphates . . . the subject of exhaustive study in the Victor Research Laboratories . . . are summarized in the table below. From the latter it is apparent that a combination of the proper alkyl and phosphate groups will produce compounds which possess, within indicated limits, properties to meet widely varying requirements. Some of these compounds are already in commercial production; others are available only in laboratory quantities. Additional information, as well as samples intended for further research, will gladly be sent upon request.

PROPERTIES OF NEUTRAL ALKYL PHOSPHATES

| COMPOUND | Mol. Wt. | Sp. Gr. at x°/4° C. | B.P. °C. | Ref. Index ND | SOLUBILITY | | | | | | |
|--|----------|------------------------|-------------|------------------|------------|---------|---------|-------|---------|------------------|---------|
| Orthophosphates, R₃PO₄ | | | | | | | | | | | |
| Trimethyl phosphate..... | 140 | 1.2052(25) | 196 | 1.3950 | Water | Alcohol | Acetone | Ether | Toluene | CCl ₄ | Naphtha |
| Triethyl phosphate..... | 182 | 1.0637(25) | 215 | 1.4039 | | | | | | | |
| Tri n-propyl phosphate..... | 224 | 1.0023(25) | 252 | 1.4136 | | | | | | | |
| Tri n-butyl phosphate..... | 266 | 0.9727(25) | 289 | 1.4203 | | | | | | | |
| Tri i-butyl phosphate..... | 266 | 0.9617(25) | 264 | 1.4173 | | | | | | | |
| Tri n-amyl phosphate..... | 308 | 0.9497(25) | 225(50mm) | 1.4283 | | | | | | | |
| Trimethylallyl phosphate..... | 263 | 0.988 (26) | 135 (5mm) | 1.445 | | | | | | | |
| Trioctyl phosphate..... | 434 | 0.921 (25) | 210 (8mm) | 1.442 | I | S | S | S | S | S | S |
| Tricapryl phosphate..... | 434 | 0.907 (25) | Decom. | 1.437 | I | S | S | S | S | S | S |
| Pyrophosphates, R₄P₂O₇ | | | | | | | | | | | |
| Tetramethyl pyrophosphate..... | 234 | 1.357 (25) | Decomp. | 1.410 | SR | SR | S | SS | PS | I | I |
| Tetraethyl pyrophosphate..... | 290 | 1.200 (25) | Decomp. | 1.417 | SR | SR | S | S | S | S | I |
| Tetrabutyl pyrophosphate..... | 402 | 1.050 (25) | Decomp. | 1.429 | R | SR | S | S | S | S | S |
| Tetraoctyl pyrophosphate..... | 626 | 0.977 (25) | Decomp. | 1.443 | R | SR | S | S | S | S | S |
| Tripolyphosphates, R₅P₃O₁₀ | | | | | | | | | | | |
| Pentamethyl tripolyphosphate..... | 328 | 1.430 (25) | Decomp. | 1.420 | SR | SR | S | I | I | I | I |
| Pentaethyl tripolyphosphate..... | 398 | 1.245 (25) | Decomp. | 1.424 | SR | SR | S | I | SS | SS | I |
| Pentabutyl tripolyphosphate..... | 538 | 1.095 (25) | Decomp. | 1.435 | I | SR | S | S | S | S | S |
| Tetrapolyphosphates, R₆P₄O₁₃ | | | | | | | | | | | |
| Hexamethyl tetrapolyphosphate.... | 422 | 1.474 (25) | Decomp. | 1.423 | SR | SR | S | I | SS | I | I |
| Hexaethyl tetrapolyphosphate..... | 506 | 1.280 (25) | Decomp. | 1.425 | SR | SR | S | SS | S | S | I |
| Hexabutyl tetrapolyphosphate..... | 674 | 1.119 (25) | Decomp. | 1.435 | R | SR | S | S | S | S | S |
| Hexaoctyl tetrapolyphosphate..... | 1010 | 1.053 (25) | Decomp. | 1.447 | R | SR | S | S | S | S | S |
| Metaphosphates, RPO₃ | | | | | | | | | | | |
| Methyl metaphosphate..... | 94 | 1.620 (25) | Decomp. | 1.439 | SR | SR | S | I | I | I | I |
| Ethyl metaphosphate..... | 108 | 1.420 (25) | Decomp. | 1.438 | SR | SR | S | I | SS | SS | I |
| Butyl metaphosphate (unstable).... | 136 | 1.227 (25) | Decomp. | 1.445 | SR | SR | S | S | S | S | I |
| Octyl metaphosphate (unstable).... | 192 | 1.151 (25) | Decomp. | 1.450 | SR | SR | S | S | S | S | S |

Key to Symbols

S = Soluble
PS = Partially soluble

SS = sparingly soluble
I = Insoluble

R = Reacts
SR = Soluble and reacts



VICTOR Chemical Works

HEADQUARTERS FOR PHOSPHATES • FORMATES • OXALATES

141 W. JACKSON BLVD., CHICAGO, ILL., NEW YORK, N. Y., KANSAS CITY, MO., ST. LOUIS, MO., NASHVILLE, TENN., GREENSBORO, N. C. PLANTS: NASHVILLE, TENN., MT. PLEASANT, TENN., CHICAGO HEIGHTS, ILL.

Like a Motorist taking the Hills...



HYPER-RESET

"Gets the Jump" on
Process Disturbances!

Have you ever tried to drive a car at absolutely uniform speed? There's only one sure way to do it. The instant you start to climb a hill, accurately judge the *rate of rise*... and imme-

diately apply the *right* amount of gas you'll need to balance it!

That's how HYPER-RESET in the Stabilog Controller "smooths out" processes, too! Operating on an entirely different principle from previous standard controllers, it senses the rate-of-change of the disturbance *at the very start*. Then instantly reacts to meet the maximum! It "gets the jump" on every disturbance!

Actual installations show that HYPER-RESET gives *stability* never even approached before. It brings smoother recovery from any process disturbance... in as little as $\frac{1}{4}$ the usual time... with as much as 50% reduction in the amount of upset. And it's all accomplished with the *single reset adjustment*!



WRITE FOR detailed Bulletin A-330. The Foxboro Co., 16 Neponset Ave., Foxboro, Mass., U. S. A. Branches in principal cities.

Stabilog Controllers by **FOXBORO**

REG. U. S. PAT. OFF.

Comes through with Flying Colors

MARBLEHEAD

High Calcium-High Quality

CHEMICAL



LIME



TODAY'S unusual demands bring out the true value of a product like Marblehead, which plays so important a part in so many different industries, vital to war production.

From its important role in purification of steel in open hearth or electric furnace, to its use in the purification of water and sewage, Marblehead Chemical Lime does its utmost to serve the battle front and home front alike.

The economy of Marblehead is a planned economy. The famous pure, rich, high calcium limestone is completely calcined in modern rotary kilns, its quality always under strict technical control, to provide a chemical lime of uniformly high efficiency and dependability.

★ **FOUR FORMS** ★

TRY A CAR NOW IN YOUR OWN PLANT



POWDERED
QUICK LIME



PEBBLE LIME



HYDRATED
LIME



LUMP LIME

**MARBLEHEAD
LIME CO.**

**160 N. LaSalle St.
Chicago, Ill.**



Control...

THE CRITICAL FACTOR
IN TRANSPORT PLANE
OR STEEL CASTING



WHEN the transport plane ferries its cargo of men or materiel across the skies, lives or equipment hang by delicate threads of control. For the heart of the huge freighter of the clouds lies not in the wingspread or motor, but in the instrument panel.

In this war, control plays a part it never before achieved... and plays it not only on battlefields and transportation routes but also on the industrial front where equipment is made.

The Lebanon Steel Foundry stresses control practices in the production of Circle L Castings. One of the most important of these practices is heat treatment. The heat treatment of every Circle L Casting is controlled to meet definite physical specifications.

Lebanon adapts the method of heat treatment to the

size, shape and composition of the casting. Practices include normalizing... annealing... liquid quench (in water or oil)... and tempering. Castings just removed from the heat treating furnace and about to be oil quenched are shown in the photograph. Lebanon heat treating furnaces, of various types, are equipped with the most modern temperature controls.

Because Circle L Castings play vital roles in American war operations, Lebanon considers it a duty to pay the premium casting soundness demands... control of foundry practice at every possible step. That's why Circle L Castings are worthy to serve such foremost industrial organizations as Terry Steam Turbine and Lukens Steel.

Lebanon metallurgists have had close contact with war production requirements since the beginning. Their experience in solving today's type of industrial problem is available to interested organizations.

LEBANON STEEL FOUNDRY • LEBANON, PENNA.
ORIGINAL AMERICAN LICEY-BEE GEORGE FISCHER (SWISS CHAMOTTE) METHOD

LEBANON *Stainless and Special Alloy* **STEEL CASTINGS**



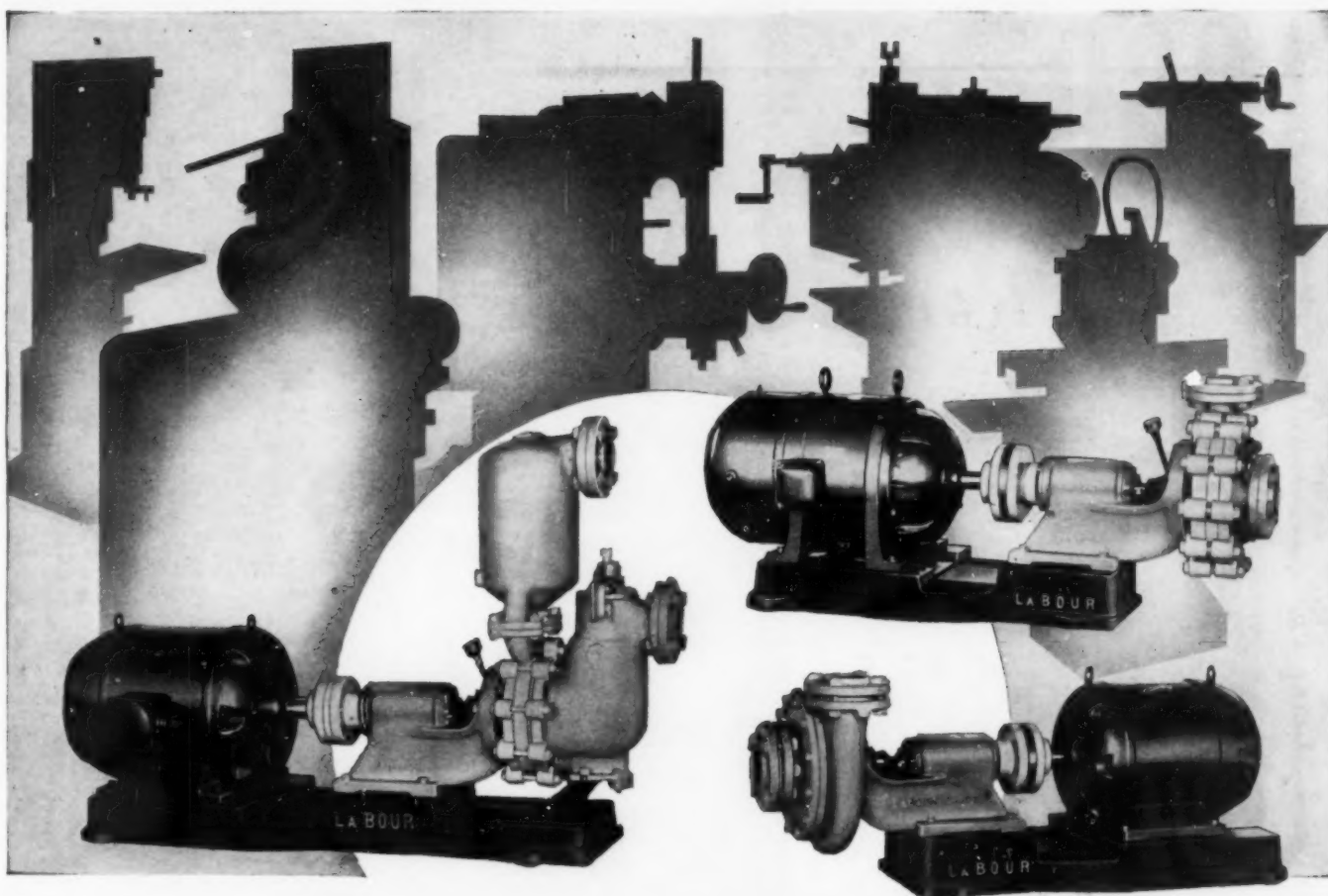
For Achievements Beyond the Line of Duty



The Army-Navy Production Award, recently conferred on The Chapman Valve Manufacturing Company, adds a new brigade to the Production Legion of American workers who have consistently worked harder and done more than they had to . . . plainly saying to the Armed Forces, by their accom-

plishments: "You're putting it on the line for us. And we're trying to do the same for you . . . to give you plenty of what you need, and get it to you in time." This pledge of continuing allegiance to the Army-Navy E Flag is voluntarily made by every man and woman in the Chapman organization.


THE Chapman Valve
MANUFACTURING COMPANY
INDIAN ORCHARD, MASSACHUSETTS



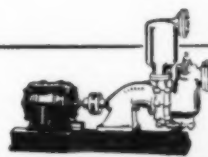
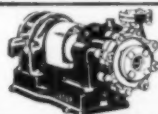
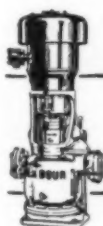
These Are **PRODUCTION MACHINES**

Like a turret lathe or a boring mill, a chemical pump is a *production machine*. Its value is directly dependent upon what it will do — how much liquid it will move for how much power cost, in how many minutes. Of course it must resist corrosion, but that's a fairly simple trick these days.

From the very beginning, LaBour Pumps have been built as working machines. Even in the days when corrosion resistance was an accomplishment in itself, LaBour Pumps were sold on a performance basis; the mechanical simplicity of a single moving part made them dependable and reduced maintenance requirements. Speed of priming, freedom from

wear, and efficiency — lower costs for operating power — were the reasons for LaBour leadership in the '20's just as they are the reasons for the continuation of that leadership today.

Our present output, even augmented as it is by around-the-clock operations and subcontracting which has added greatly to our facilities, is required to meet urgent war demands. We regret our inability to serve our many friends and customers whose businesses are not within this category, though we are naturally proud of the job LaBour Pumps are doing in helping to make the things needed for victory.

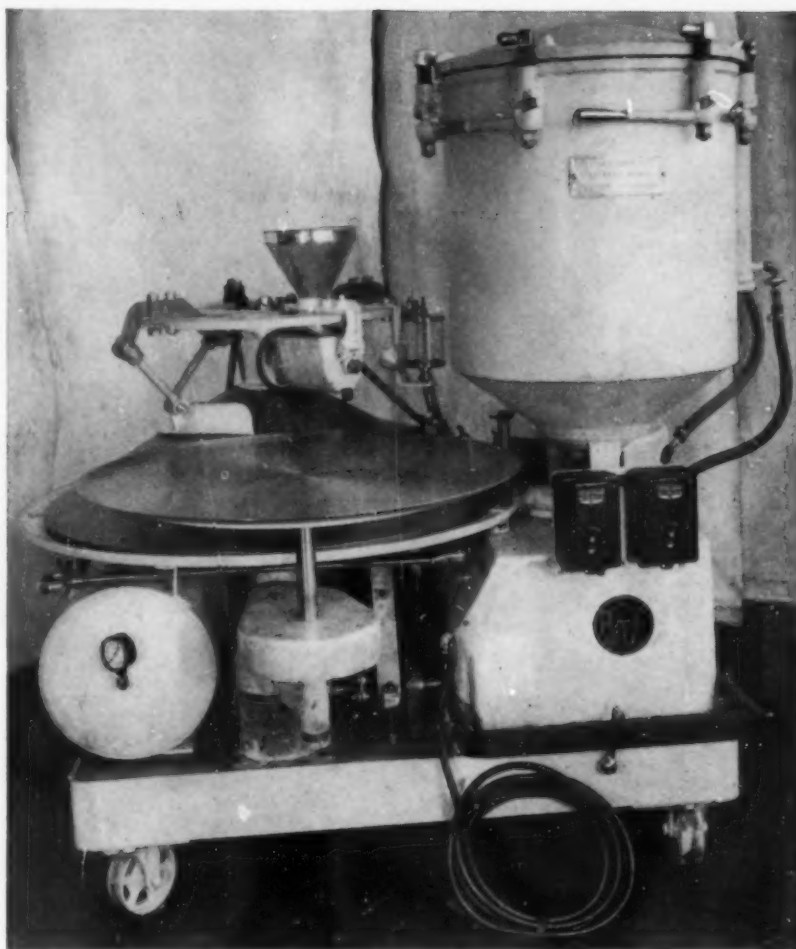


PUMPS

THE LABOUR COMPANY, INC., ELKHART,

INDIANA, U. S. A.

600 *Doz.*
Rolls
A Day
On
SKF's

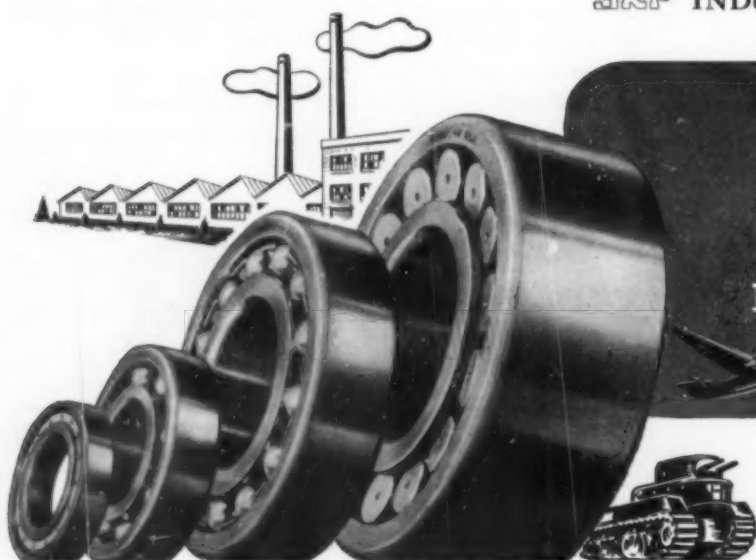


● Built by AMERICAN MACHINE & FOUNDRY CO.

Bakers who make over 600 dozen of rolls per day make no mistake by using this Rhodes Roll Machine. For this machine uses a cushion of air to fill scaling pockets of the dividing head at speeds up to 250 pieces per minute . . . without constant bearing attention. Of course, the bearings are SKF's — which explains the ease with which moving parts function and the freedom from slowdowns caused by bearing trouble. SKF's maintain their factory tolerances indefinitely, need no adjustments, and require only infrequent lubrication. You'll find them wherever the need is for Performance.

5168

SKF INDUSTRIES, INC., PHILADELPHIA, PENNA.



SKF

BALL AND ROLLER
 BEARINGS

A black and white photograph of a large industrial machine, likely a steam engine or pump, situated in a factory or workshop. The machine is complex, with various pipes, valves, and a large flywheel visible. It is positioned in the foreground, with a large, dark, rectangular object (possibly a tank or container) in front of it. The background shows the interior of a large building with tall, vertical structural elements and a hanging light fixture.

STANODRIP

THE RIGHT LUBRICANT BREAKS PRODUCTION BOTTLENECK

- **Watch new equipment**, as well as old machines that now carry a heavier load, for poor lubrication. High bearing temperatures, leakage, excessive consumption, and oil contamination are all warning signs.
- **Revise lubricating schedules** at the start to meet the demands of longer hours of operation, higher speeds, and heavier loads.
- **Choose lubricants** for quality—the best can't cost as much as one breakdown.

● One hour out of every 8-hour shift the wood working machine (above) at the Stillwater (Minnesota) Mfg. Co. had to be stopped to allow motors to cool. As often as once a week the machine was laid up to clean accumulated dust and oil from the motors—no slight job on one 25 H.P., two 15 H.P., and two 10 H.P. motors.

With the need for all-out production on this machine, a Standard Oil Engineer was called in to analyze its lubrication. He found that the conventional engine oil used leaked slightly from the motor bearings. This oil caused the dust to adhere to the motor windings, and overheating resulted.

He recommended Stanodrip—a dripless, non-creeping oil. After six months use it has not been necessary to shut down the machine either to cool off or to clean the motors. Production has been increased 12%. Oil consumption is one-fifth of what it used to be. Operating, maintenance, and lubricating costs have been substantially reduced, says Superintendent R. E. Grant.

Other typical examples of reduced maintenance through Standard Lubrication Engineering service are given on the next page.

OIL IS AMMUNITION . . . USE IT WISELY

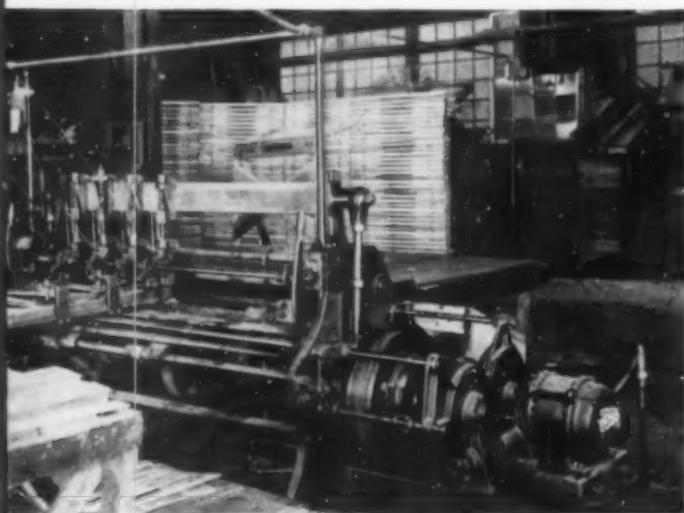
HOW TO SAVE

MAINTENANCE MATERIALS AND MANPOWER

Your plant is one in a million if the scarcity of manpower and replacement parts aren't problems. It's one in many hundreds of plants if better lubricants and better lubricating methods can't help you save on one or both of these maintenance items. And here's how to find out if you can save:

Pick out equipment on which you have made replacements recently—where bearings failed or where oil systems or gear cases became fouled. Let a Standard Lubrication Engineer see if he can find the cause of the trouble. Here's a typical example:

The operator of the machine (below) found that the grease used in the clutch mechanism left a resinous



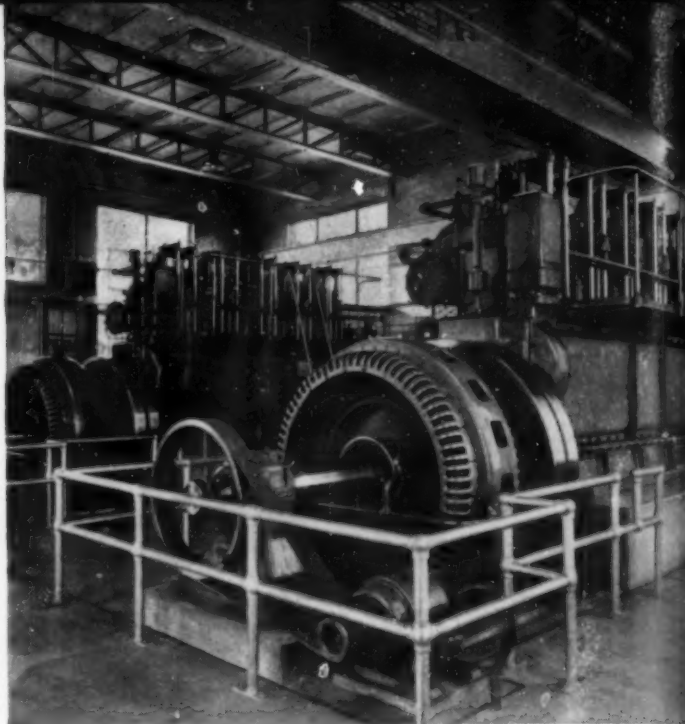
Monthly cleaning of clutch cases on this box stapling machine was eliminated by changing to Superla Grease.

deposit. In spite of the fact that the case was cleaned monthly—a waste of maintenance and machine time—clutch rings showed signs of wear. But there might be an even greater delay if clutch rings had to be replaced.

The problem was given to a Lubrication Engineer who analyzed operating conditions and recommended a grease that would meet the conditions without separating.

Superla Grease, which he recommended, shows no signs of forming deposits in the clutch case after six months of operation. Clutch ring wear is greatly reduced, and the operator has stopped worrying about clutch failures.

This is the advantage of getting a Standard Lubrication Engineer's help. He can match the product to the job. It eliminates time-taking experiments.



**KEEP DIESELS ON THE LINE
WITH LESS CLEANING...LESS
REPAIRING**

Repairs were less than \$10 last year on each of the Diesels in a Missouri mu-

nicipal light plant, pictured above. One engine gave over 6,400 and the other 7,700 H.P. hours per gallon of lubricating oil. Moreover, Nonpareil has been used for three years without a sign of sludging or ring sticking.

Records like this for low maintenance and low oil consumption mean a lot in times like these when conservation of labor and parts becomes increasingly important. They indicate what you can expect.

Test Nonpareil Diesel Oil in your engines. Prove just how clean and trouble-free your Diesel operation can be. A Standard Lubrication Engineer will help you make the test.



**HERE'S WHERE YOU'LL FIND
A STANDARD OIL ENGINEER**

Call any local Standard Oil Company (Indiana) office in the middle western states listed below, or 910 South Michigan Ave., Chicago, Illinois. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

COLORADO • ILLINOIS • INDIANA • IOWA • KANSAS • MICHIGAN
MINNESOTA • MISSOURI • MONTANA • NORTH DAKOTA • WYOMING
SOUTH DAKOTA • WISCONSIN

OIL IS AMMUNITION . . . USE IT WISELY

The Instrument of Tomorrow



WORKING
Today
IN THE WAR
INDUSTRIES



THE Brown "Continuous Balance" Air-o-Line Potentiometer Controller is the culmination of more than three-quarters of a century of experience in building industrial measurement and control instruments.

The experience of the past combined with the demands of today have resulted in a new potentiometer air-operated controller that will meet the needs of many future years.

In this radically new potentiometer controller a "Continuous Balance" Unit takes the place of the galvanometer used in the conventional mechanical-type potentiometer employing a periodic or cyclic mechanism.

It is the only potentiometer-type instrument in which the air control flapper mechanism is *instantly* positioned in response to temperature changes.

The "Continuous Balance" measuring system makes it possible to take full advantage of thermocouple responsiveness. Positive control action

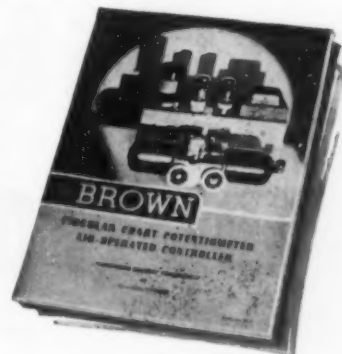
is assured by the well-known, dependable Brown Air-o-Line Control Unit, thousands of which are in service throughout industry.

The Brown Circular Chart Air-o-Line Potentiometer Controller brings to industry, for the first time, the ideal synchronization of measurement and control for temperature processes.

In the synthetic rubber war program engineers have approved this instrument as the ideal controller for the difficult fractionating problems in the manufacture of butadiene.

BULLETIN SENT ON REQUEST

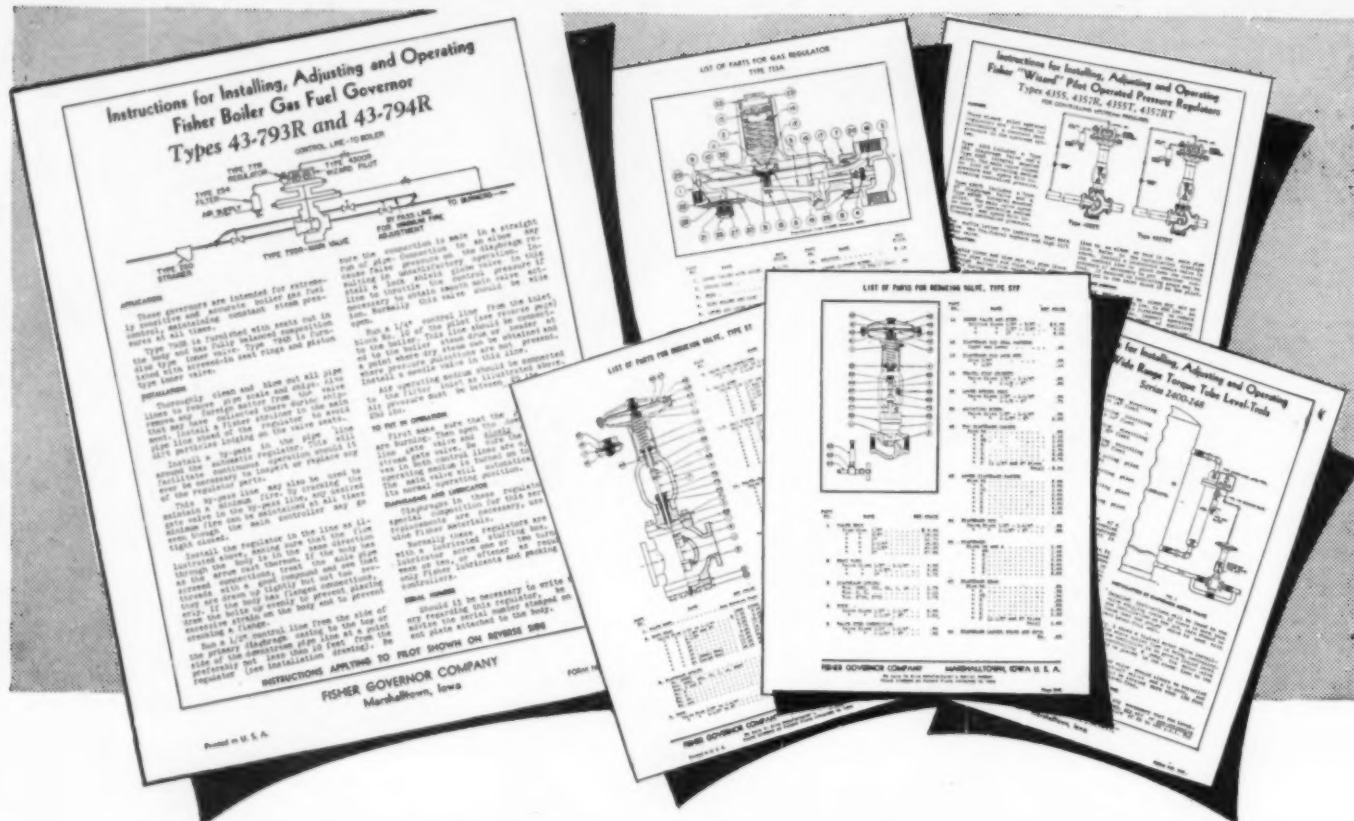
Outstand features such as:
Control Unit — Throttling
Range Dial—Automatic Reset
Dial—Booster Pilot Valve
—Control Index Knob—Direct
and Reverse Action—
Compression Type Fittings
—Control by-Pass Panel—
Balancing Motor—Slide Wire
—Pen Arm Release—Chassis
—are fully described in Bulletin 15-4. Write for it.



BROWN

"Continuous Balance" POTENTIOMETER CONTROLLER

THE BROWN INSTRUMENT COMPANY, 4478 WAYNE AVENUE, PHILADELPHIA, PENNSYLVANIA
DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO.



MAINTENANCE

HELP FOR

Your FISHER CONTROLLERS



FISHER

To help you maintain the superior performance of your Fisher Controllers, we offer you, without charge, complete maintenance and repair parts information applying to the particular Fisher Controllers now in service in your plant.

Simply give us the Serial Number that appears on each Controller. This number enables us to determine from our permanent requisition file the exact construction and operation details of your Fisher Controllers. From that information we will prepare **YOUR SPECIAL MAINTENANCE MANUAL** containing replacement parts specifications, as well as installation, adjustment and operation instructions.

Now, more than ever before, your Fisher Automatic Controllers must be adequately maintained to insure uninterrupted operation. Those controllers have a big job to do, and they will do it if you will give them proper care. Fisher Controllers seldom need attention, but periodic inspection may reveal worn parts... need of adjustment... lubrication needs... or other minor corrections that if neglected may eventually cause serious production delays and even plant shut-downs.

Write for your specially prepared Fisher Maintenance Manual today—be sure to include Serial or Type Numbers of your Fisher Controllers.

Proper priority certification required on all parts orders.

GOVERNOR COMPANY
1811 FISHER BUILDING
MARSHALLTOWN, IOWA

Get the advantages of **HIGH SPEED** motor efficiency in this **SLOW SPEED** drive

Philadelphia MotoReduceRs have been conceived, built and tested as integral drive units. They are well balanced, compact and highly efficient . . . up to 97% in service . . . and during the last 10 years have solved drive problems in almost all types of applications. Trouble-free service and low maintenance are other factors that make them a logical choice to meet today's all-out production needs.

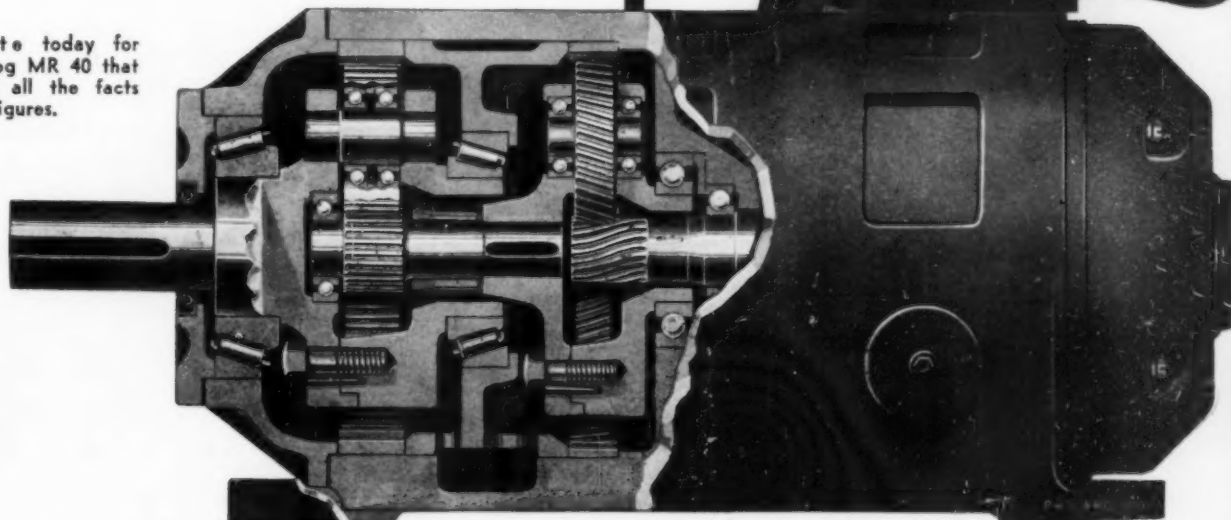
MotoReduceRs are easy to install, being single units, fewer alignment problems occur. Compact, streamline construction makes space savings possible and often they can be fitted-in where other drives would be impractical.

Both horizontal and vertical types are available in all standard motor ratings with various enclosures.



Vertical
MotoReducer

Write today for
catalog MR 40 that
gives all the facts
and figures.



Cut-away view of Horizontal
MotoReducer

PHILADELPHIA GEAR WORKS

**INDUSTRIAL GEARS
AND SPEED REDUCERS
LIMITORQUE VALVE CONTROLS**



**ERIE AVENUE & G STREET
PHILADELPHIA, PA.
New York, Pittsburgh, Chicago**

**Philadelphia
LIMITORQUE
CONTROL**
operates all types
of valves, etc.,
safely, economi-
cally, from conven-
ient stations.



**Philadelphia
WORM GEAR
SPEED REDUCER**
right angle drives—
vertical or horizontal.
Wide range of ratios
and horsepower.



**Philadelphia
MotoREDUCER**
The economical self-contained drive,
Horizontal or Vertical types—various
ratios and horsepower.



**Philadelphia
HERRINGBONE
SPEED REDUCER**
for heavy loads at high
speed. Single, Double,
Triple Reductions, various
ratios and horsepower.



**Philadelphia
GEARS**
All types and sizes
of industrial gears.
Can be supplied
in all materials.

To Avoid Fire Hazard

ISOLATE OIL FROM HIGH-TEMPERATURE STEAM

DE LAVAL

4893

DE Laval turbine during 4000 h.p. operation

IN this De Laval multistage turbine power is transmitted mechanically to the valve-lifting gear **1** at the top of the casing from a pilot-controlled hydraulic cylinder in the sub-base, **2** which also encloses the speed governor, accumulator and relief valve, and other parts relating to the governor control.

The main reservoir for both lubricating and hydraulic pressure oil, the main and auxiliary oil pumps, the strainers, and the oil coolers are located on a platform **3** below the sub-base.

No oil cylinders or oil piping are over the steam chest or the steam piping, thus keeping oil away from high-temperature steam.

Other requirements of high-pressure, high-temperature steam have been met by the use of special alloys and improved design throughout.

Ask for Publication T-3527

DE LAVAL

Steam Turbine Co.
TRENTON, N. J.

MANUFACTURERS OF TURBINES STEAM, HYDRAULIC, PUMPS, CENTRIFUGAL PROPELLER, ROTARY DISPLACEMENT, MOTOR-MOUNTED, MIXED-FLOW, CLOGLESS, SELF-PRIMING, CENTRIFUGAL BLOWERS and COMPRESSORS, GEARS, WORM, HELICAL and FLEXIBLE COUPLINGS

Ion Exchange Reactions

offer new methods in chemical processing

SUPPOSE you have a non-electrolyte, such as sugar, contaminated with a salt. How do you purify it? You might dialyze it, but that is slow. You might concentrate it, relying upon a difference in solubility for adequate separation, but that is expensive. Or the salt might be precipitated by conventional chemical treatment.

However, consider this proven means of quantitative separation—Permutit's cation and anion exchangers. Pass such a solution first through Zeo-Karb* H, a cation exchanger which converts the salt into the corresponding acid. Pass this solution through De-Acidite,* and the acid is absorbed, leaving only the solution of non-electrolyte. The salt is removed down to a few ppm. The cost is as low as 5¢ per 1,000 gallons treated, dependent upon individual factors.

This example should not limit your consideration of the application of this useful and little known process. Wherever cations, anions, or both can be exchanged to advantage, think of Permutit. We have pioneered this field and have experience in the chemistry of ion exchange and in the production of ion exchangers. Of even greater importance is our skill in the design, con-

struction, and operation of equipment. We can help you bring a process from the test tube, through pilot plant development to finished commercial production. We have been through it, many times.

Constant research at Permutit's laboratories shows many promising applications of ion exchange to chemical and chemical engineering processes. Some few are listed below. We hope that they provoke your interest, and we shall appreciate an opportunity to put our information at your disposal.

*Trademark Reg. U. S. Pat. Off.

WRITE FOR FREE BOOKLET

Address The Permutit Company, Dept. K, 330 West 42nd Street, New York, N. Y. In Canada: Permutit Company of Canada, Ltd. . . . Montreal . . . Toronto . . . Winnipeg . . . Calgary.

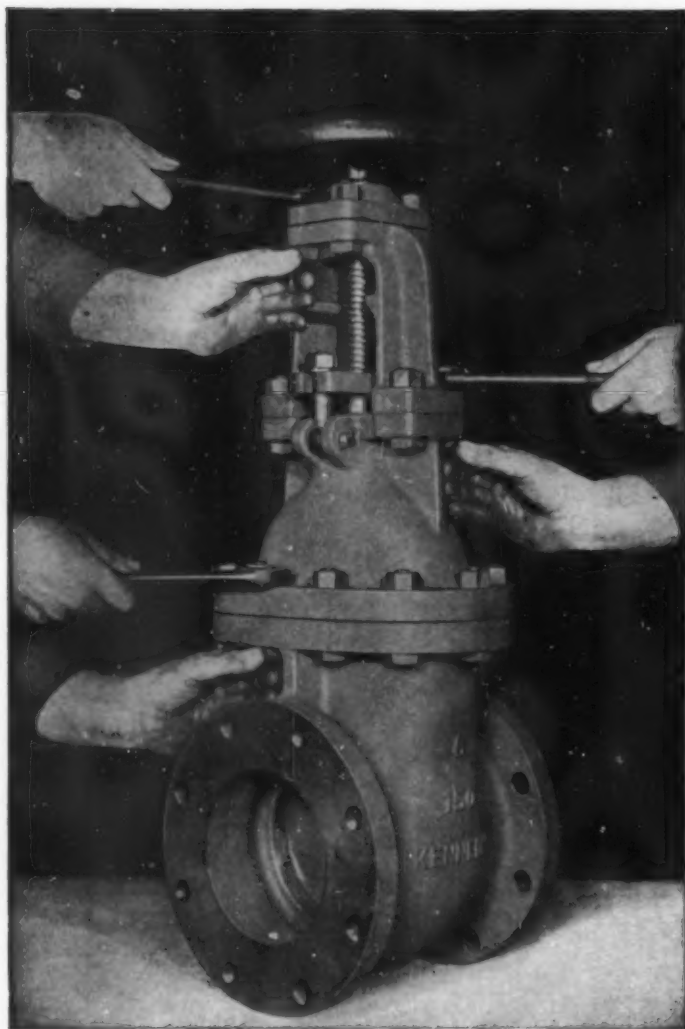
A Typical Ion Exchange Installation



FIELDS OF APPLICATION FOR PERMUTIT CATION AND ANION EXCHANGERS

| | |
|------------------|---|
| Beverages | Milk and Milk Products |
| Chemicals | Non-ferrous Metals, such as Copper, Lead and Others |
| Drugs | |
| Electroplating | Precious Metals |
| Foods | Sugars—Beet, Cane, Corn and Others |
| Glue and Gelatin | |
| Insecticides | |

PERMUTIT Water Conditioning and Ion Exchangers
...Materials and Equipment...Chemicals



EVERY PART easy to reach easy to handle

CONVENIENCE is one of the outstanding characteristics of Kennedy Valves.

In this standard outside-screw-and-yoke Kennedy Iron-body Wedge Gate Valve, for example, the convenience features at the stuffing box alone include bolts that swing out of the way, washer-type nuts, slotted gland, and yoke shelves for the gland.

Again, all bolts throughout the valve have their nuts on top of flanges and are accessible to open-end wrenches. Handwheels have large-diameter, widely spaced spokes and oval rims for ample leverage and firm grip.

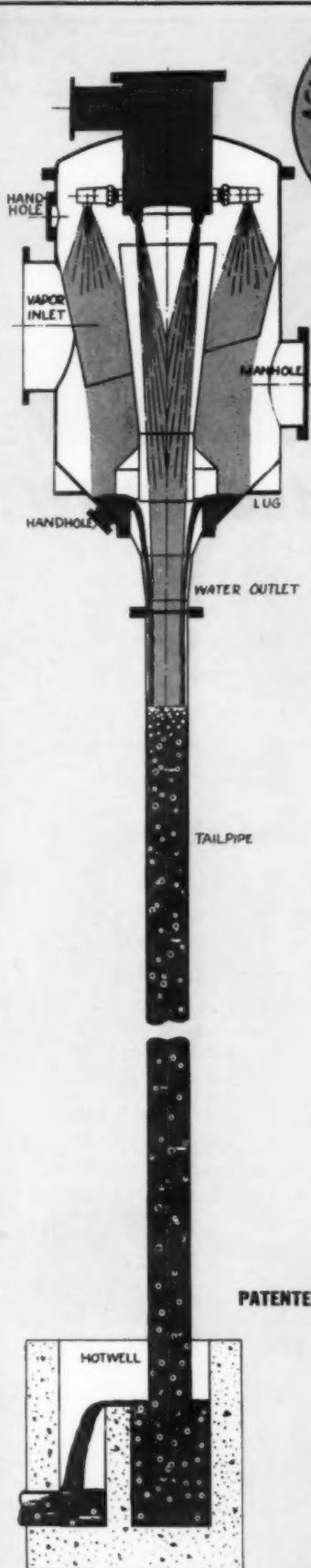
These convenience features indicate the care that has been given to every detail in the design of this and every other Kennedy Valve type, in addition to operating mechanisms that are thoroughly reliable, bodies with generous margins of extra strength, and construction throughout for long, dependable service with minimum maintenance expense.

You are safe when you use Kennedy Valves. Catalog describing the entire line of these extra value iron-body and bronze gate, globe, angle and check valves for all standard pressures and services will gladly be sent on request.

THE KENNEDY VALVE MFG. CO.
ELMIRA • NEW YORK



KENNEDY *valves... pipe fittings... fire hydrants*



PATENTED MULTI-JET

Barometric Condensers

OFFER

EXCLUSIVE FEATURES:

- 1 Steam or vapor is condensed in a counter-current flow to cooling water, thus producing high vacuum.
- 2 Minimum quantity of cooling water.
- 3 Converging jets designed solely to remove incondensable gas and air.

**LOW INITIAL AND MAINTENANCE COSTS
NO VACUUM PUMP REQUIRED**

Service Applications: VACUUM PANS • EVAPORATORS
DISTILLING UNITS • VACUUM DRYERS • VACUUM COOLERS
COOKERS • CRYSTALLIZERS • DEODORIZERS, ETC.

**OTHER TYPES FOR BAROMETRIC OR
LOW LEVEL OPERATION INCLUDE
TUBULAR • SURFACE • PLATE • TRAY & DRIP CONDENSERS**



PATENTED

**SPECIAL EQUIPMENT
COORDINATED UNITS
COMPLETE PLANTS**

ACME

Processing Equipment

ACME COPPERSMITHING & MACHINE CO., ORELAND (near Phila.) PA.

IF YOU CAN'T USE IT

Junk it!



... it's needed—urgently needed—NOW!



50% of all new steel for guns and ships and tanks and war production equipment is *scrap* . . . and steel mills need 6,000,000 more tons by the end of the year. Americans everywhere have turned out to turn in the scrap; but the cold fact is

—we have not collected enough!



Unarmed or poorly armed men can't be sent to a Second Front—or any Front! *Collect every bit of metal you can find . . . Don't save it unless it's indispensable . . . And get it in, fast, to your local junk dealer or salvage committee!*

THROW YOUR SCRAP INTO THE FIGHT!

... —

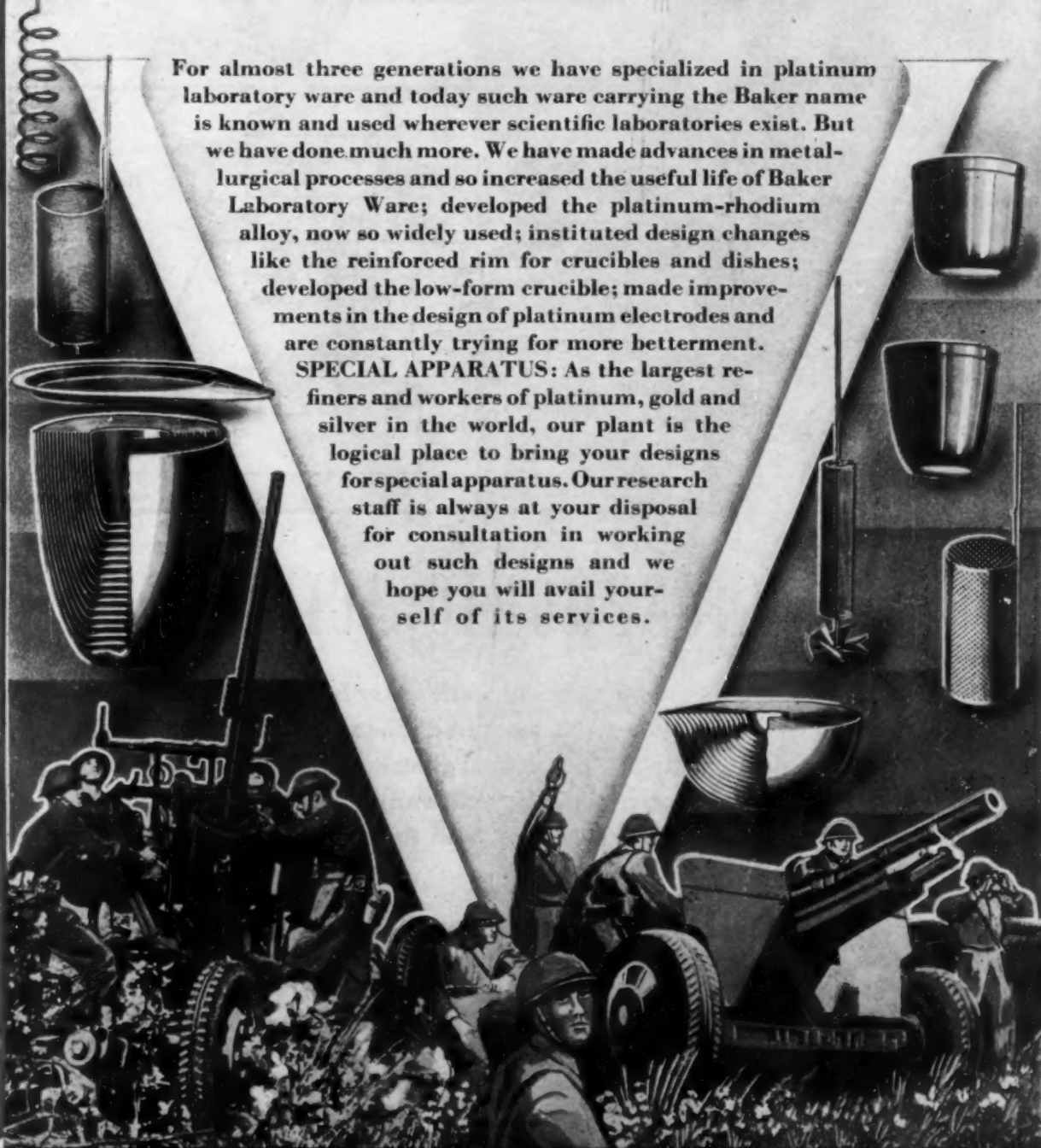
DOWNINGTOWN IRON WORKS
DOWNINGTOWN, PA.
WELDED and RIVETED PRODUCTS

SINCE 1913, FABRICATORS OF QUALITY STEEL AND ALLOY
PRESSURE VESSELS

Seventy-Five Years is a Long Time

For almost three generations we have specialized in platinum laboratory ware and today such ware carrying the Baker name is known and used wherever scientific laboratories exist. But we have done much more. We have made advances in metallurgical processes and so increased the useful life of Baker Laboratory Ware; developed the platinum-rhodium alloy, now so widely used; instituted design changes like the reinforced rim for crucibles and dishes; developed the low-form crucible; made improvements in the design of platinum electrodes and are constantly trying for more betterment.

SPECIAL APPARATUS: As the largest refiners and workers of platinum, gold and silver in the world, our plant is the logical place to bring your designs for special apparatus. Our research staff is always at your disposal for consultation in working out such designs and we hope you will avail yourself of its services.



BAKER & CO., INC.

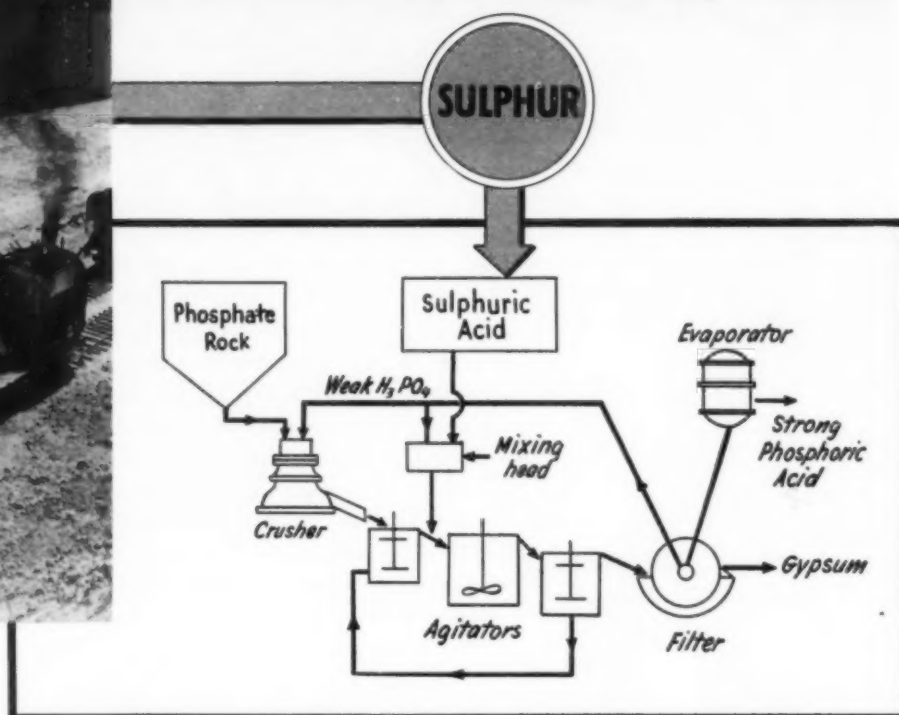
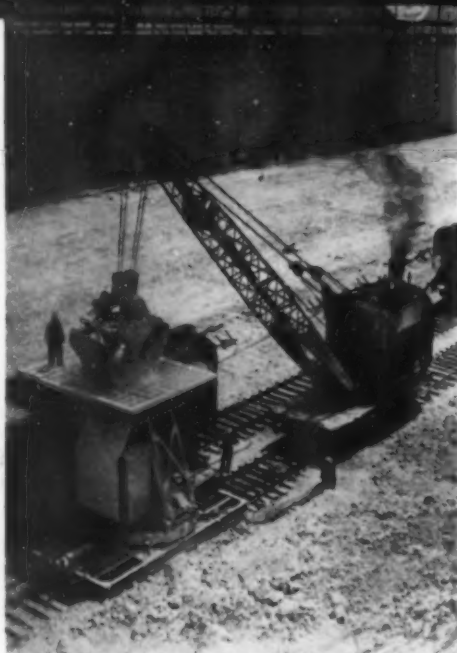
SMELTERS, REFINERS AND WORKERS OF PLATINUM, GOLD AND SILVER
113 Astor St., Newark, N. J.

NEW YORK

SAN FRANCISCO

CHICAGO

HOW **SULPHUR** SERVES INDUSTRY



PHOSPHORIC ACID

Phosphate rock is mixed with recycled wash water containing phosphoric acid and is then finely ground. A measured amount of sulphuric acid is added and the slurry is run into a series of agitators. Here the sulphuric acid reacts with the rock to form phosphoric acid and gypsum. The phosphoric acid is concentrated in an evaporator, and the gypsum is discarded or utilized as a by-product.

Sulphuric acid aids in the production of many acids essential to the processing industry. Phosphates are essential in fertilizers. Phosphoric acid supplies the acid constituent in baking powder, soft drinks, jams and jellies. It is used in sugar refining, water softening, photography, yeast culture and

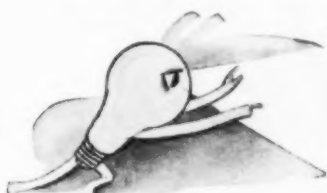
dental cements. Our supplies of essential acids are not threatened by any shortages of the important raw material used in the manufacture of sulphuric acid. The Texas Gulf Sulphur Company has in stock more than enough Sulphur to supply all industries for a year or more.

TEXAS GULF SULPHUR CO.
 75 E. 45th Street New York City
 Mines: Newgulf and Long Point, Texas

12-TG-1

ARE THESE 3 SABOTEURS ON YOUR PAYROLL?

GLARE



These 3 "Saboteurs" can slow up production on any night shift. First—and worst—is *glare* in workers' eyes. Glare from bare or poorly shaded lamps, or from shiny metal surfaces, can hasten fatigue and breed spoilage and accidents. Glare can often be corrected merely by making a few simple changes in existing lighting.

SHADOWS

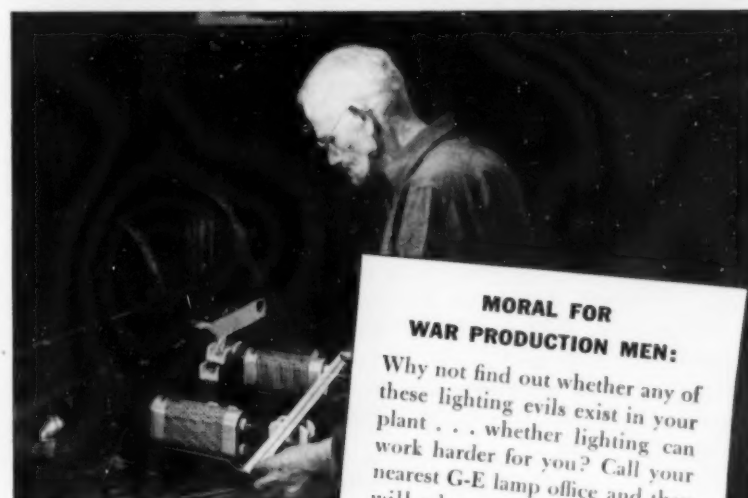
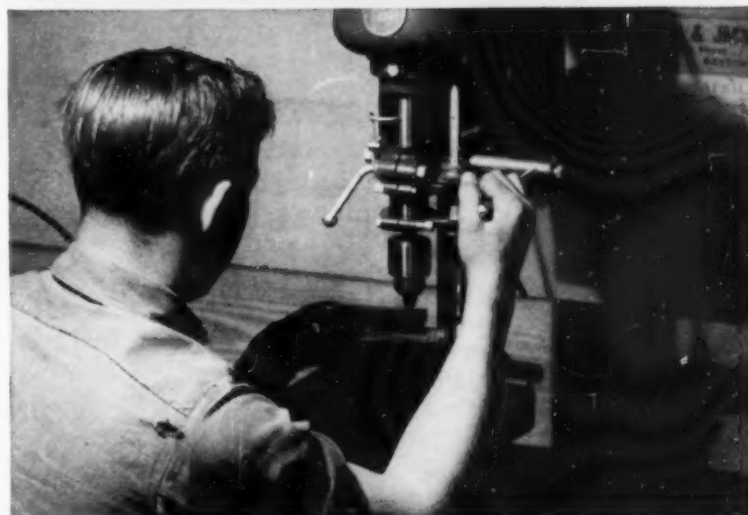


Shadows on the work are the bane of every mechanic's life. They make it almost impossible to work to the new close tolerances demanded in war production. The remedy may be supplementary lighting on machines. Or raising or lowering existing fixtures. Or both. A G-E lighting engineer can probably tell you the answer. And the last thing he has any idea of is to try to sell you a new lighting installation!

DIRT



Dirt on lamps, fixtures and walls can sabotage the best lighting ever installed! In some cases, light output of brand new G-E fluorescent lighting installations dropped off 50% in a short time simply because no one cleaned the lamps and fixtures. A G-E lighting engineer can help you start a regular maintenance program. Help you get full light from every dollar's worth of lamps and electricity!



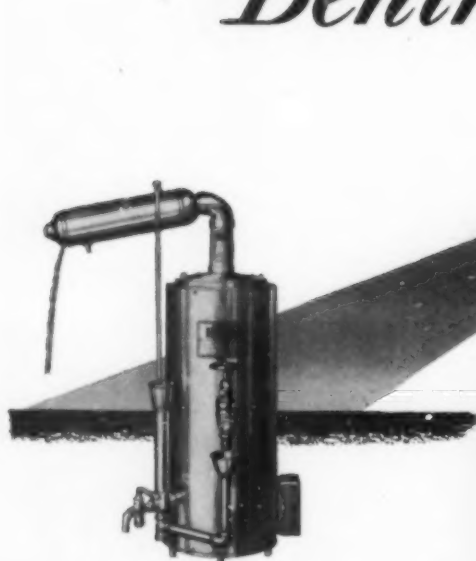
MORAL FOR WAR PRODUCTION MEN:

Why not find out whether any of these lighting evils exist in your plant . . . whether lighting can work harder for you? Call your nearest G-E lamp office and they will place a trained Wartime Lighting Counsellor at your service. Or see your local electric service company or your G-E lamp supplier.

G-E MAZDA LAMPS

GENERAL  ELECTRIC

Behind Both Doors



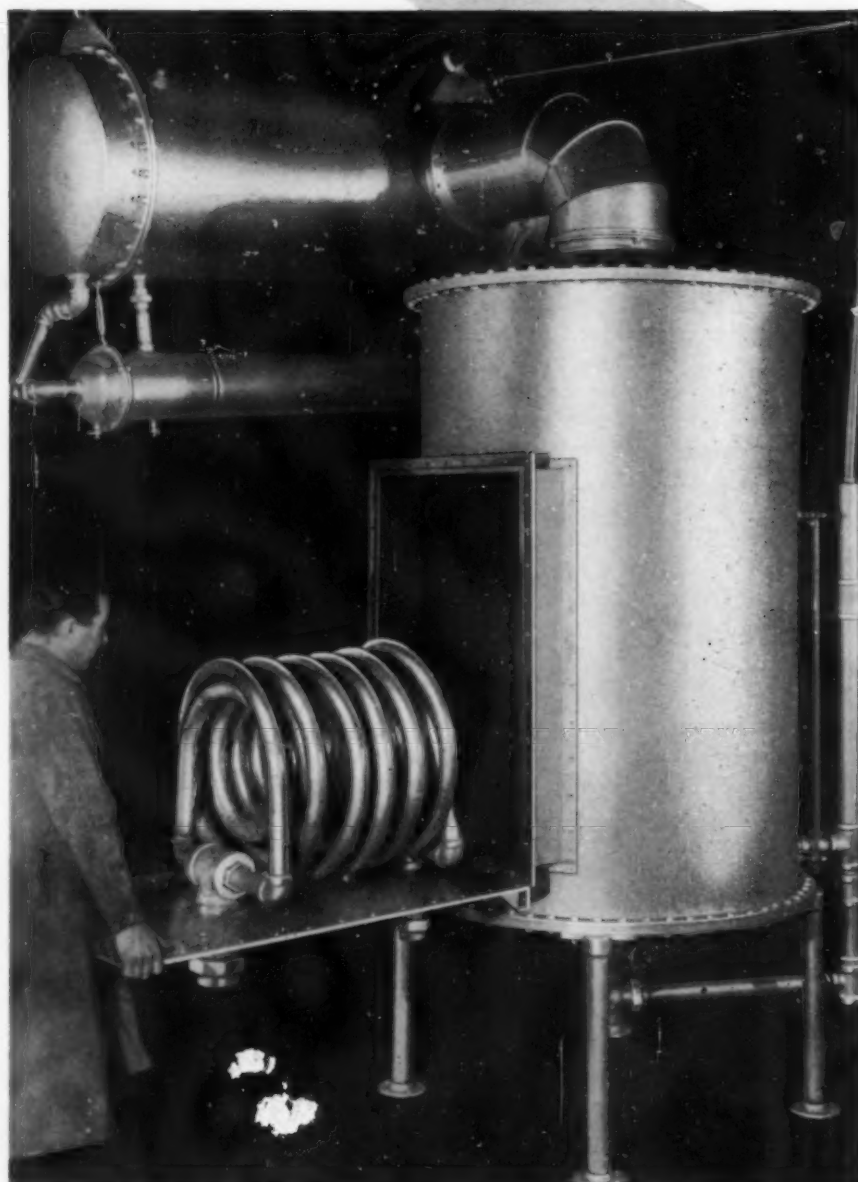
Wherever pure distilled water is needed—whether it's for laboratory work or actual plant production—the chances are you'll find Barnstead Water Stills in operation. For Barnstead Stills are the producers of the purest water at the lowest cost. And it makes no difference whether it's the smallest $\frac{1}{2}$ gallon per hour Barnstead laboratory still or the largest 500 gallon per hour unit, the distillate is always the same—consistently pure, day in and day out.

Barnstead industrial type stills are, of course, designed for low operating cost—without affecting the quality of distillate. Condensers are easily demountable for quick cleaning, and a special evaporator trap door makes scale removal from the heating coil very simple. A constant bleeder device prevents rapid scale formation, and the extra high evaporator eliminates all possibilities of entrainment.

Sizes for Barnstead Water Stills range from $\frac{1}{2}$ to 500 gallons per hour. Operation is by gas, steam or electricity.

Barnstead
STILL & STERILIZER CO. Inc.

4 LANESVILLE TERRACE, FOREST HILLS, MASS.





SEGREGATED Scrap...

is your link to VICTORY!

Scrap salvage is a vital factor in the war effort. To be fully effective a scrap program must include methods for segregating and conserving critical alloying elements so urgently needed in the construction of tanks, guns, ships and planes.

Ferrous and non-ferrous metal scrap should be collected in separate containers at the machine where they are generated. Each class of high-speed

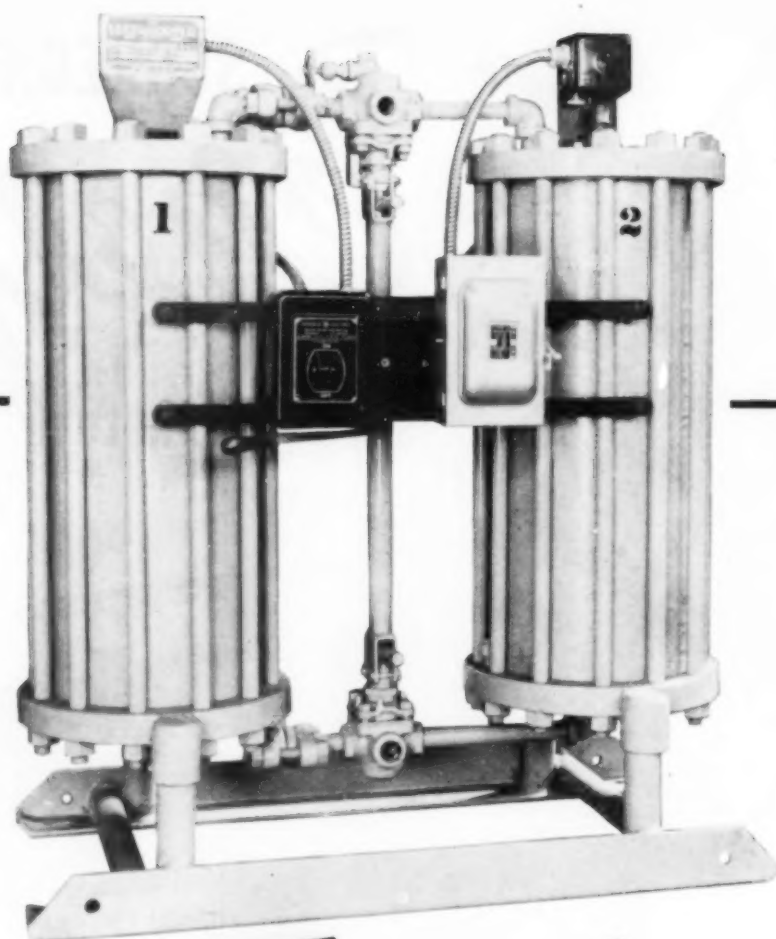
tool steel and each type of constructional alloy steel should likewise be kept separate so that the alloy content can be returned to service.

Remember, — alloy scrap which is segregated, classified and labeled according to type and composition is a vitally important commodity today—and urgently needed to augment primary supplies of Nickel, molybdenum, tungsten, etc.

The metallurgical experience of our technical staff is available to aid you in these and other phases of metal salvage.

KEEP SCRAP MOVING INTO WAR PRODUCTION!

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET
NEW YORK, N. Y.



**FOR *Thorough* DRYING
OF COMPRESSED AIR or GAS**

THIS Lectrodryer is now in service for drying compressed air at 400 pounds pressure. Using Activated Alumina as the drying agent, its operation is thorough and dependable. High pressure Lectrodryers are available for operation on pressures as high as 3500 pounds per square inch and units now in use have adsorption capacities up to about 500 pounds of water per day, drying to very low dew-points. Some of these Lectrodryers are used for drying compressed air for instrument control, some in the manufacture of liquid air, others are used in connection with gas liquifaction processes and for numerous other uses. Drying operations are continuous with equipment of this type. While

the drying agent in one part of the unit is at work, that in the other is being reactivated. Lectrodryers operate on a 24-hour schedule.

Lectrodryer experience is serving, too, in handling many new problems arising from industry expansion to meet war production schedules. Lectrodryer equipment is available in many standard types and sizes . . . they are also built to specification to meet individual service needs. What are your drying problems—air, gas or organic liquids? Write us, describing your requirements, and we'll tell you what Lectrodryer will do for you. Pittsburgh Lectrodryer Corporation, 32nd Street and Putney Way, Pittsburgh, Pennsylvania.

LECTRODRYER



These are Times to **DOUBLE-CHECK** Your Valves ✓✓

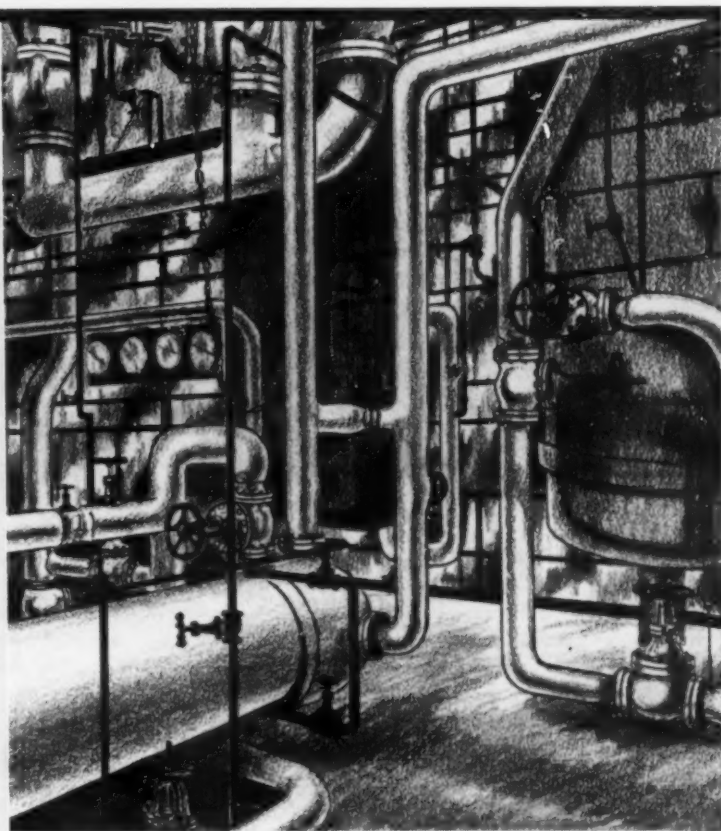
Proper care of valves begins with their purchase — meaning, that it pays in the end to buy good valves first.

But proper care doesn't end there...even the best valves need looking after, and prompt servicing, when necessary, will save more costly repairs and replacements later.

And these days, when it isn't easy to get new valves, and those you now have must do double and triple duty, it's just good business to do a little extra checking and inspecting of this vital equipment.

In the interest of uninterrupted production and the preserving of critical materials, Lunkenheimur urges every valve user to take extra special care of valves he now has in service. They'll respond to good treatment and repay you in better service, less time out for repairs, and a minimum expenditure for maintenance.

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings and proper "end use" symbols on their orders. This will be of mutual helpfulness.



ESTABLISHED 1862
THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U.S.A.
NEW YORK CHICAGO
BOSTON PHILADELPHIA
EXPORT DEPT. 318-322 HUDSON ST., NEW YORK

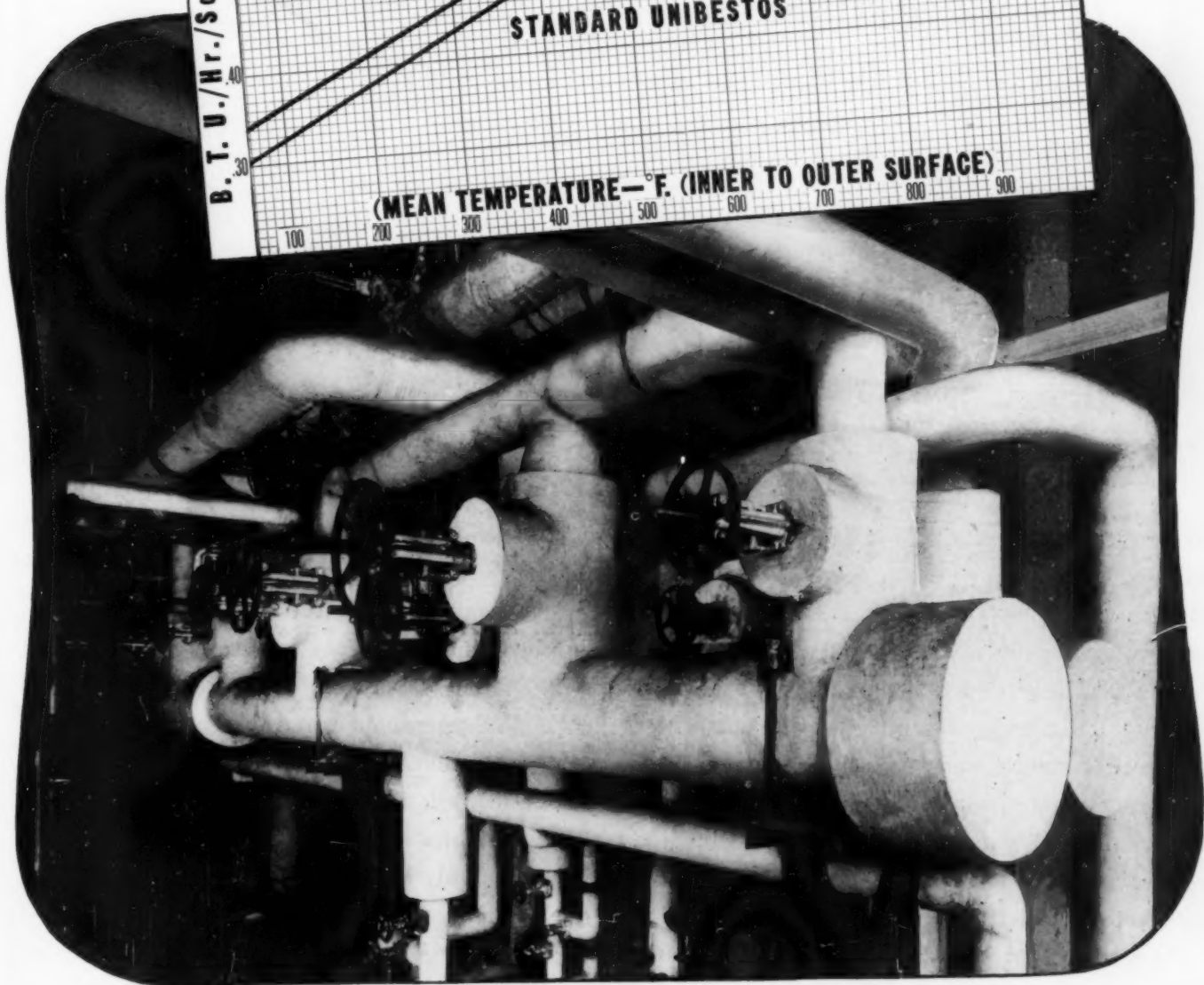
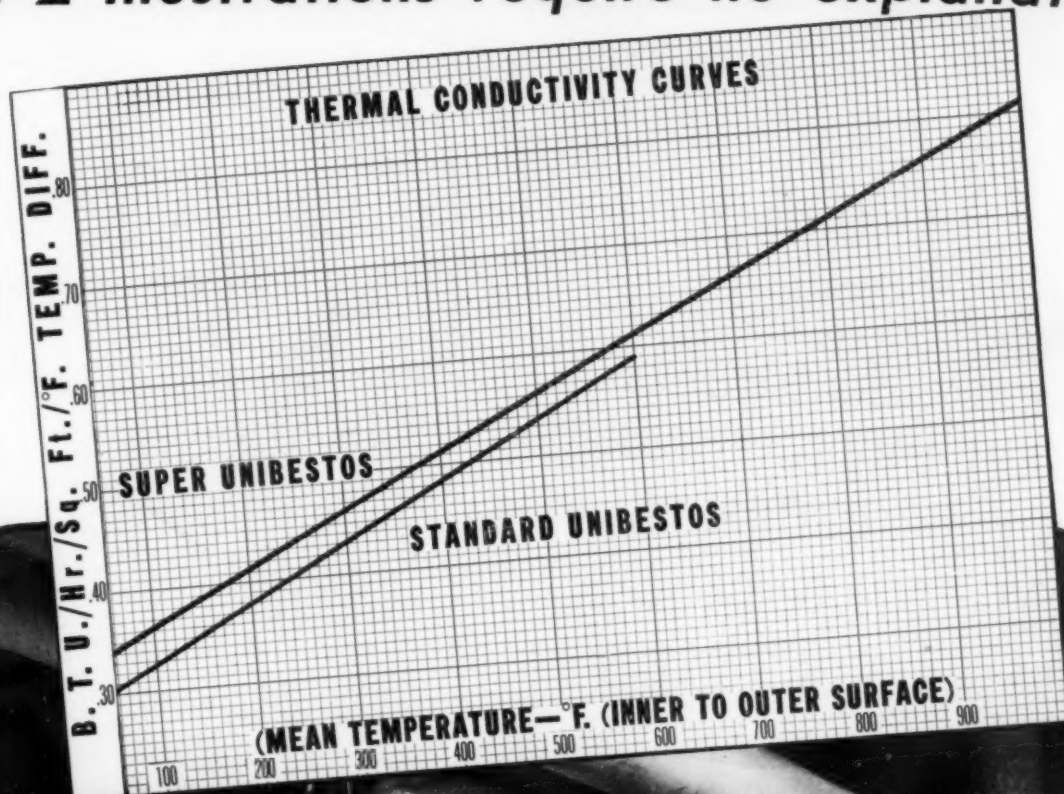


LUNKENHEIMER VALVES

★ ★ ★
IN WAR OR PEACE
YOU CAN DEPEND ON
THE LOUIS ALLIS CO.



These 2 illustrations require no explanation!



unibestos is available in Standard material, for temperatures up to 750°; Super, with a temperature limit of 1200°; Combination, with a temperature limit of 1200°. These temperature limits permit the use of one material at maximum efficiency for a wide range of purposes. Unibestos is available in half sections up to 30" pipe diameter and from 32" to 60" in quadrants from 3/4" to 5" in thickness. Standard and Super are available in single layer construction with provision for expansion in piping, where required.

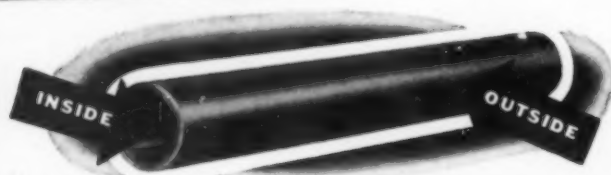
Conserving the Vitamins of Industry: B.T.U.'S!

UNION ASBESTOS & RUBBER CO.

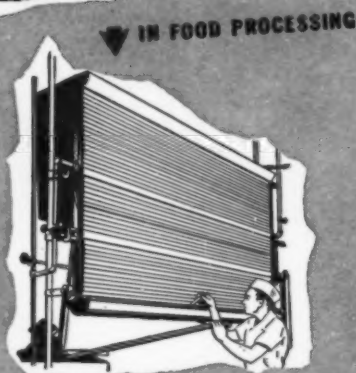
1821 SO. 54th AVE., CICERO, ILL. • 420 LEXINGTON AVE., NEW YORK • 116 NEW MONTGOMERY ST., SAN FRANCISCO



**WHERE DOUBLE* CORROSION
IS YOUR PROBLEM...USE
BRIDGEPORT
DUPLEX TUBING**



"ENGINEERED TO MEET YOUR SERVICE REQUIREMENTS"



Where the inner and outer surfaces of a tube are exposed to two different types of corrosive agents, Bridgeport Duplex Tubing assures longer service life than can be obtained with ordinary tubing.

The relatively thin-walled tube of copper alloy in Duplex Tubing gives added protection where you need it—on the outer surface exposed to attack by corrosive gases, vapors, or liquids. And, a second tube wall of steel is mechanically bonded to the copper alloy to form a single strong unit with satisfactory heat transfer characteristics.

As a result, only a comparatively small amount of copper is needed in Bridgeport Duplex Tubing to provide the advantages of this critical metal to

help extend service life of your condensers and heat exchangers.

Many manufacturers of synthetic rubber, aviation gasoline, chemicals, foodstuffs, and ammonia refrigeration systems are using Duplex Tubing to conserve copper supplies and keep tube replacement costs down. Investigate its advantages for your own applications. Sample lengths are available now for testing in your plant. Write Bridgeport today outlining your tubing problems.

*Inside and Outside



BRIDGEPORT BRASS COMPANY
BRIDGEPORT, CONNECTICUT • Established 1865

BRIDGEPORT BRASS



Serving the Nation on the Industrial Front



ALL battles are not fought at sea, in the air or on the field. Many battles—important ones, too—are

fought on the industrial front.

The battles against hazardous, profit-sapping Dust and Fumes, for example. Dust, fume or odor creating operations, where properly ventilated, mean salvage of valuable products, protection of workers' health, elimination of community nuisance and reduction of explosion hazards.

Schneible Multi-wash dust collectors are ideal equipment for winning this industrial battle. Low in cost, high in efficiency, completely maintenance-free, they effect positive dust, fume and odor control.

In the plant pictured—a 10,000 c.f.m. Multi-wash collector removes lime dust from air exhausted from hydrator, baggers and other operations in the lime plant. Other Schneible's in the process industries are used for suppressing or salvaging hydrogen sulphide, ammonia, gluten feeds, sugars, oils, rare metals, etc.

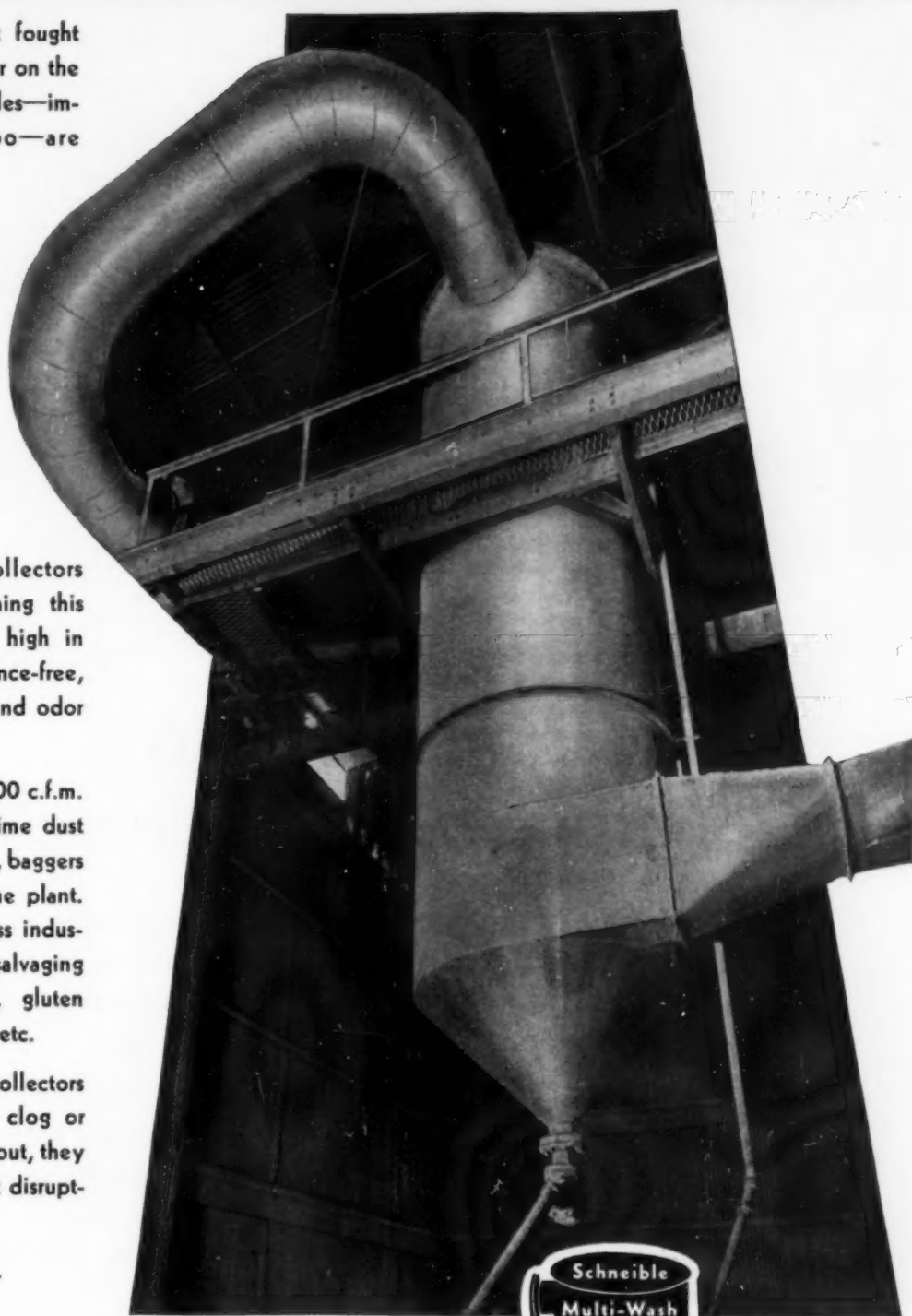
Only Schneible Multi-wash collectors have no parts to break, burn, clog or rapidly wear. Used indoors and out, they can be readily installed without disrupting processes.

Send for details—do it now.

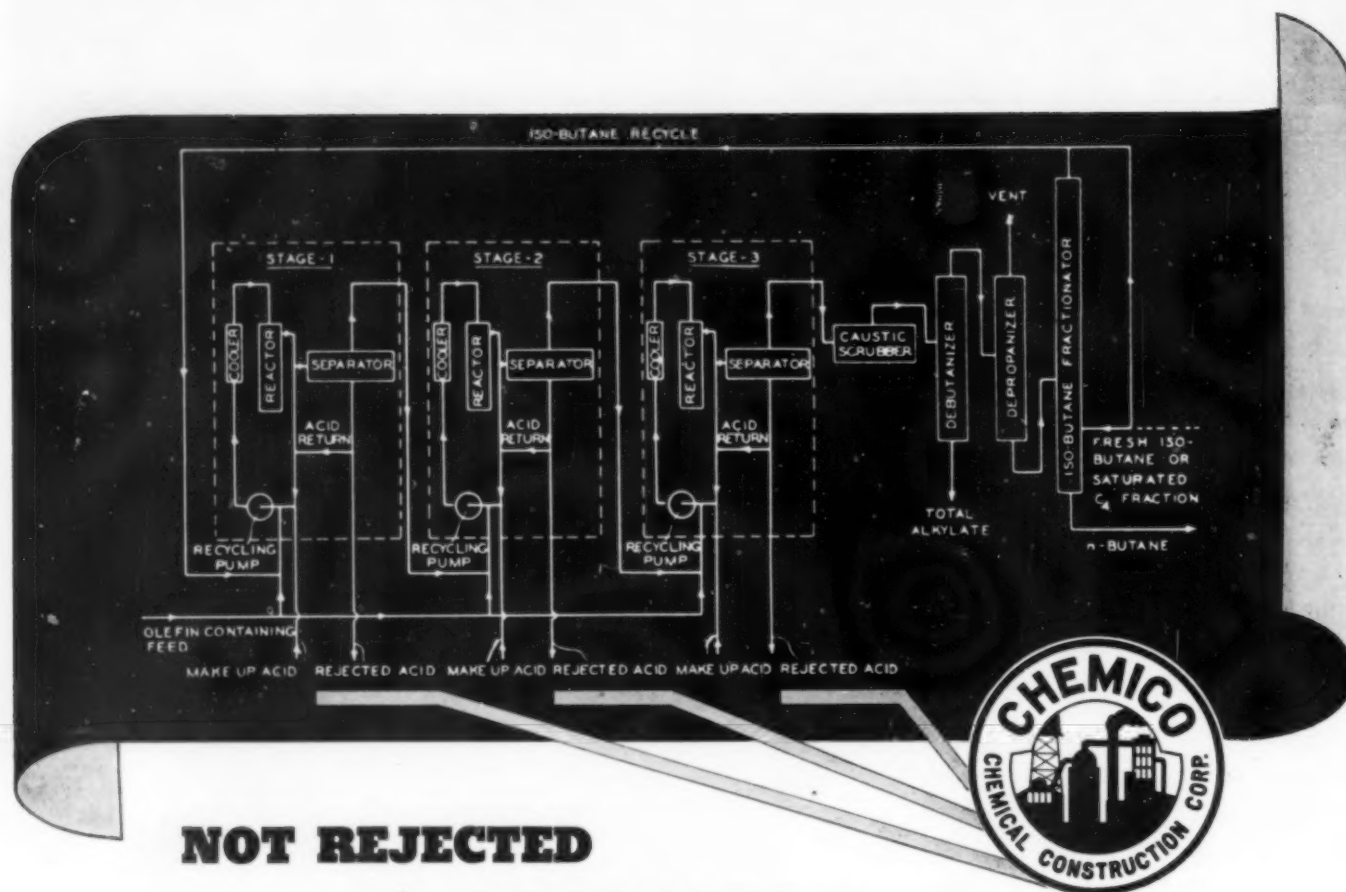
CLAUDE B. SCHNEIBLE CO.

3953 Lawrence Ave., Chicago, Ill.

Offices in Principal Cities



SCHNEIBLE



There need be no "rejected acid" in an alkylation system. With a CHEMICO sulphuric acid recovery plant, all the waste acid can be purified and fortified and then returned to the system for re-use with make-up acid which can also be provided by the CHEMICO plant.

A CHEMICO acid plant is therefore an important element in providing most economical operation of an alkylation system. This application of CHEMICO acid recovery processes is but one of many which have been developed by the CHEMICO acid specialists over a period of 27 years.

Today, CHEMICO is devoting all its experience and resources to furthering the National war effort, and offers its facilities to any organization with acid requirements for war work.

CHEMICAL CONSTRUCTION CORPORATION

30 Rockefeller Plaza

New York

Cables, Chemiconst, New York

European Representatives, Cyanamid Products, Berkhamsted, Herts., England

CHEMICO PLANTS are PROFITABLE INVESTMENTS



What every plant operator should know about GLASS PIPING!

Q: Is GLASS PIPING available now?

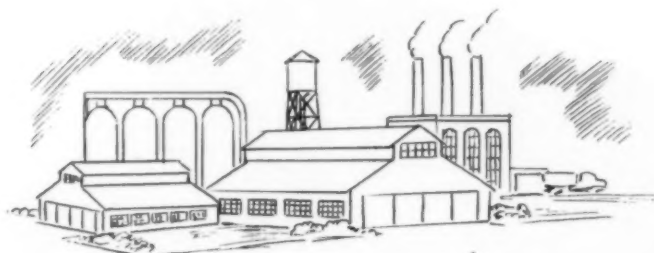
A: Yes!

Glass-making materials are still fairly plentiful. And many plant operators are discovering that PYREX Brand Piping not only solves piping shortage problems but also, in many cases, does a better job than the piping they formerly used.

We do need priority ratings that enable us to get accessories (flanges, gaskets), to assign necessary labor, and to establish the position of your order in our production line. With such priorities we have been making 6 to 8-week deliveries.

Available sizes and lengths: 1", 1½", 2", 3", and 4" diameters—and any length from 6 inches to 10 feet (longer lengths on special request). There are corresponding ells, tees, return bends, and reducers.

Accessories: Joints are compression type—with conical pipe ends compressed to a self-centering gasket by metal flanges and clamping bolts. We supply gaskets of materials suited to the liquid or gas you want to convey.



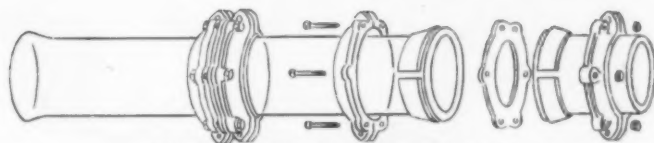
WHERE DOES IT GIVE BEST SERVICE?

Wherever hot or corrosive liquids or gases must be conveyed . . . wherever products must be protected from contamination . . . wherever it is important to know what is happening *inside* a line . . . there PYREX Piping gives you its most profitable service.

Chemical plants use it to eliminate their corrosion problems, because it resists all hot or cold acids (except HF). Food and beverage manufacturers like it because it's easy to keep clean, either by simple flushing or with steam or strong hot cleaning solutions. It helps to produce a purer product.

WATCH FOR CORNING ADVERTISEMENTS!

Watch this magazine for more information in Corning's advertisements headed "What every plant operator should know about Glass Piping." And write for PYREX Piping Bulletin No. 814. Industrial Division, Corning Glass Works, Corning, N. Y. Branch Offices: New York, 718 Fifth Ave.; Chicago, Merchandise Mart.



IS IT EASY TO INSTALL?

Plant workmen have found it easy to make installations themselves. In fact, green plant mechanics have recently done first-rate installations with PYREX Piping.

You may install from one piece to a whole system—for PYREX Piping may be joined to existing metal lines and equipment. And it is hung and supported much like other types of piping. (See photo at top of page.) We do recommend that hangers and supports be padded, to minimize scratching.



WILL IT STAND UP MECHANICALLY?

Yes. PYREX Piping is recommended for working pressures up to 100 p.s.i. But glass in this form is *not* as strong as metal. So, care must be taken to avoid installation strains or sharp impact. Nearly 20 years of service under all kinds of plant conditions have proved that only simple common sense and reasonable care are required to handle PYREX Piping without trouble. The glass itself, incidentally, is very hard—about twice as resistant to abrasion as ordinary plate glass. Thus, the piping is particularly suitable for abrasive, corrosive slurries. You can install and use PYREX Piping with confidence.



WHAT DOES IT COST?

The initial cost of PYREX Piping (accessories included) is about the same or less than the cost of full-weight copper or brass piping, in comparable sizes, and is considerably less than the cost of stainless steel.

And because PYREX Piping does not wear out under acid attack, it gives long trouble-free service, with resultant low long-time cost.

The left-hand photograph at the top of the page is an example. That PYREX Piping has carried a slurry of crushed quartz and sulphuric acid for over eight years—without one cent of maintenance.

"PYREX" is a registered trade-mark and indicates manufacture by Corning Glass Works, Corning, N. Y.

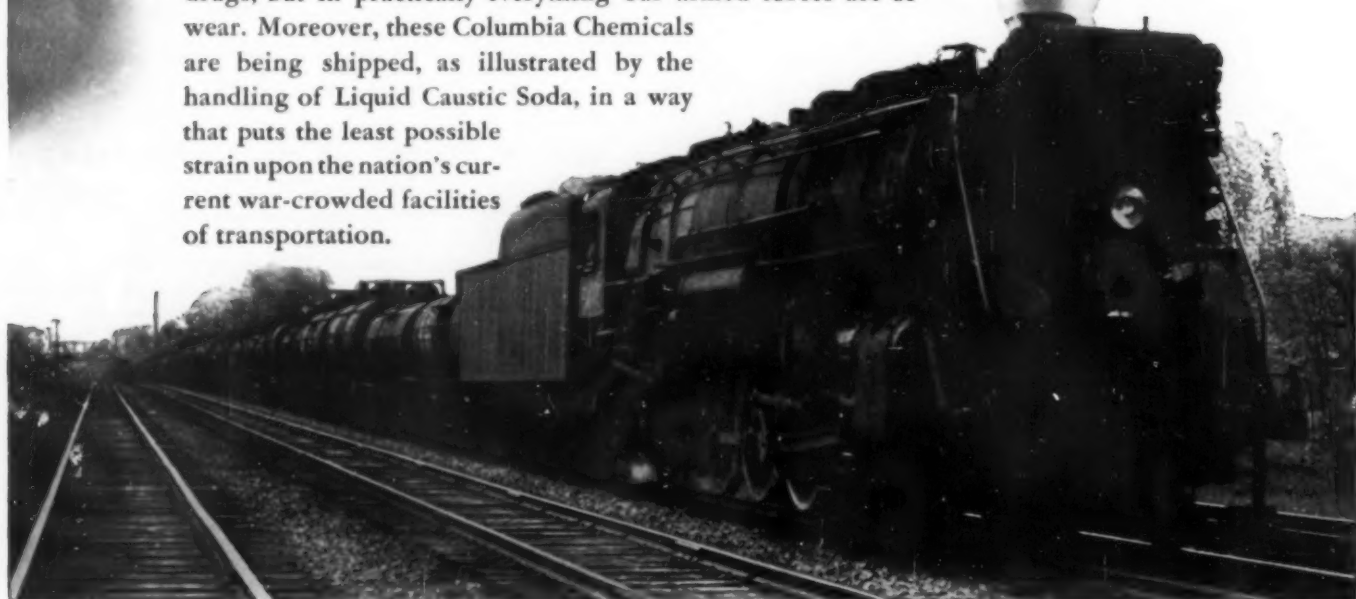
CORNING
Glass Works

Pyrex Industrial Glass

COLUMBIA CHEMICALS

6 COLUMBIA CARS = 10 ORDINARY CARS

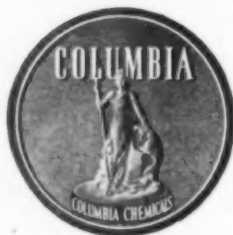
Whatever contributes to the freeing of America's railroads from unnecessary hauling burdens today performs noteworthy service. This, we are privileged to say, is one of the outstanding functions of COLUMBIA'S fleet of specially developed tank cars for the transporting of Liquid Caustic Soda. This COLUMBIA tank car development is now saving as high as 40% in the number of tank cars handled by many Liquid Caustic Soda users. Thus, not only are COLUMBIA CHEMICALS being relied upon as essential aids in the manufacture of rubber, steel, munitions, chemicals, textiles, soap, paper, food, drugs, but in practically everything our armed forces use or wear. Moreover, these Columbia Chemicals are being shipped, as illustrated by the handling of Liquid Caustic Soda, in a way that puts the least possible strain upon the nation's current war-crowded facilities of transportation.



ESSENTIAL INDUSTRIAL CHEMICALS

SODA ASH • CAUSTIC SODA • SODIUM
BICARBONATE • LIQUID CHLORINE • SILENE*
CALCIUM CHLORIDE • SODA BRIQUETTES
MODIFIED SODAS • CAUSTIC ASH • PHOSFLAKE
CALCENE** • CALCIUM HYPOCHLORITE

*Precipitated Calcium Silicate **Precipitated Calcium Carbonate

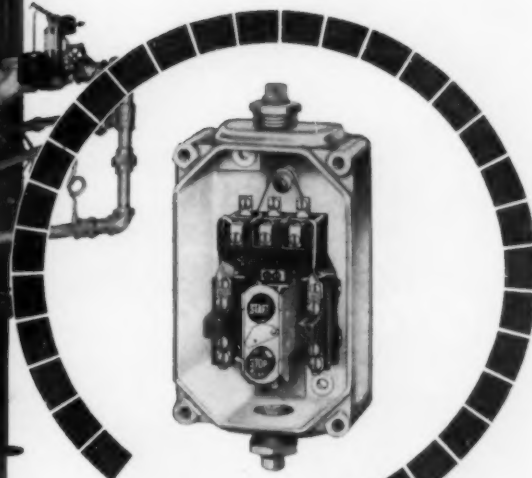


PITTSBURGH
PLATE GLASS COMPANY
COLUMBIA CHEMICAL DIVISION
GRANT BUILDING, PITTSBURGH, PA.

CHICAGO • BOSTON • ST. LOUIS • NEW YORK • CINCINNATI
CLEVELAND • MINNEAPOLIS • PHILADELPHIA • CHARLOTTE



**The
Popularity of This
Manual Starter
Is
No Accident!**



Simple design . . . no contact maintenance . . . ease of installation . . . these three outstanding features explain why Allen-Bradley Bulletin 609 manual starters are so popular in the chemical and process industries.

Simplicity means fewer moving parts . . . no flexible jumpers . . . no failures due to trouble-making gadgets.

The double break, silver alloy contacts never need filing, cleaning, or dressing . . . an extremely important

advantage in starters with bolted water-tight or gas-tight enclosures, which take time to open for inspection. A-B contacts do not weld.

Easy to wire because there is lots of wiring space. All terminals are easily accessible in the front of the starter.

You can install A-B starters . . . and forget 'em! They are attractive in appearance and an asset to any plant. Let us send you the latest bulletin on these trouble-free starters.

Allen-Bradley
Company



1337 S. First St.
Milwaukee, Wis.

**ALLEN-BRADLEY
SOLENOID MOTOR CONTROL**

A Complete Line of WATER-TIGHT MOTOR CONTROLS for the Process Industries

Starters



Bulletin 709 water-tight automatic starter.

Control Stations

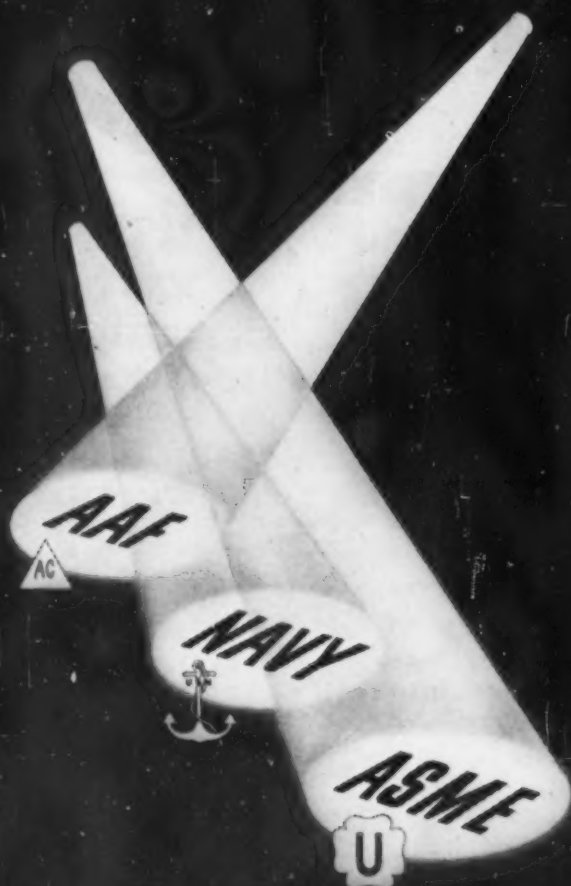


Bulletin 800 water-tight stations. Standard and heavy duty Push buttons or thumb lever.



Also — Allen-Bradley starters for other applications. Bulletin 705 reversing switch incorporates two starters, mechanically interlocked for positive reversing. Bulletin 712 combination starter has a manual disconnect switch and automatic starter combined in one cabinet.

Qualified
Welders and Procedures
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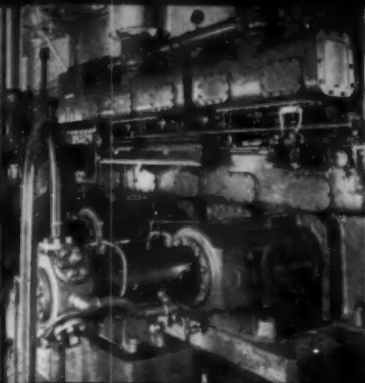
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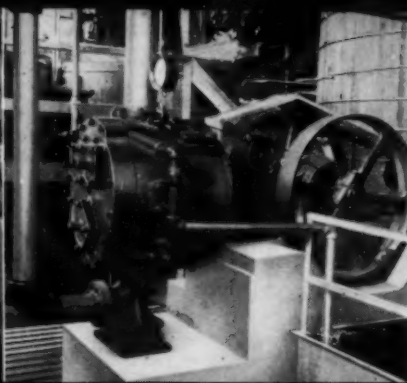
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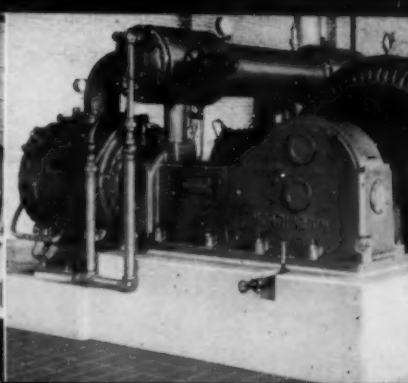
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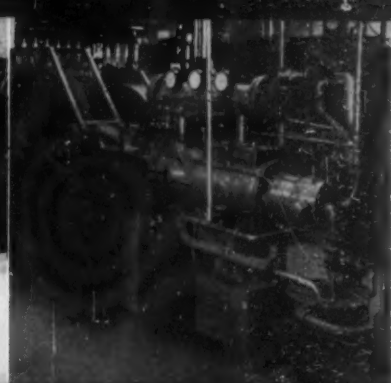
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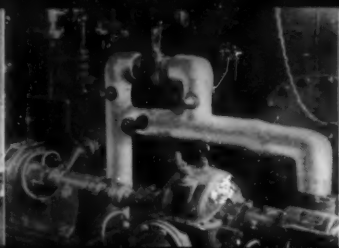
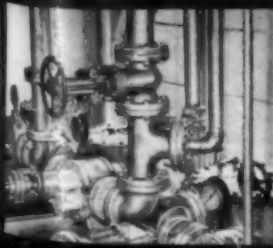
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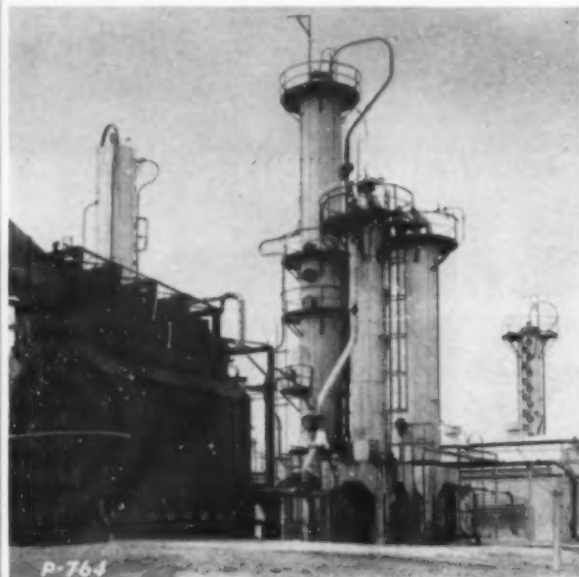
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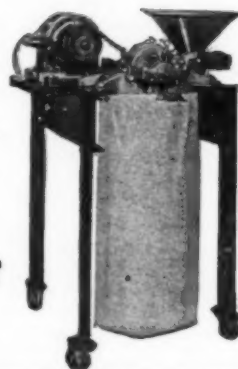
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* The amount by which stress is greater at the crotch in a fitting having uniform wall thickness depends only on its radius. Mathematical analysis (specifically the Lorenz formula) shows the stress at the crotch to be:

$$S = \frac{pr(2R-r)}{2t(R-r)}$$

Where S = Bursting stress, lbs. per sq. in.
p = Internal pressure, lbs. per sq. in.
r = $\frac{1}{2}$ inside diameter of fitting (O.D. if Barlow's formula is desired).
t = Wall thickness in inches.
R = Center line radius of fitting, inches.
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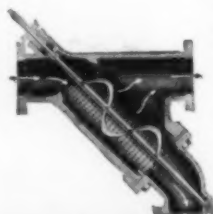
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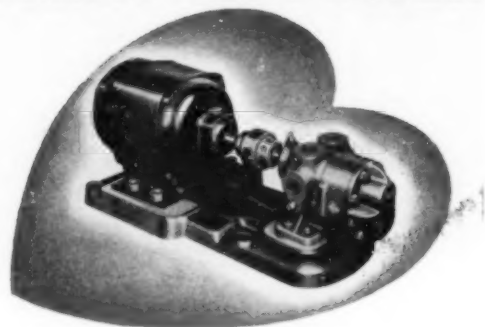
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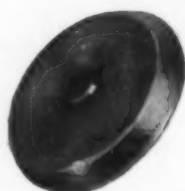
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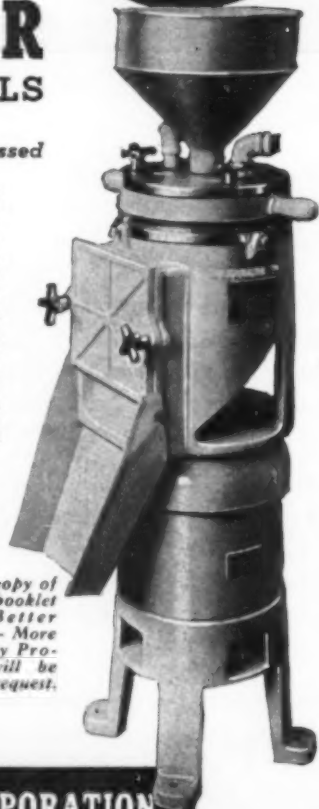
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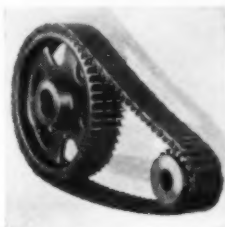
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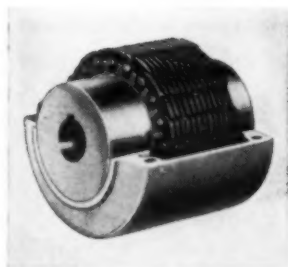
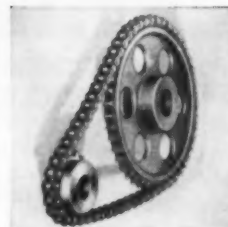


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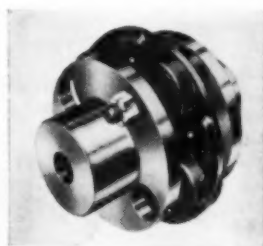


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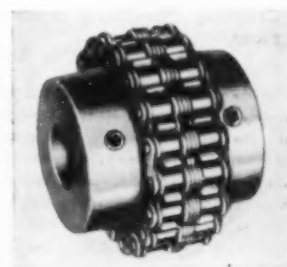
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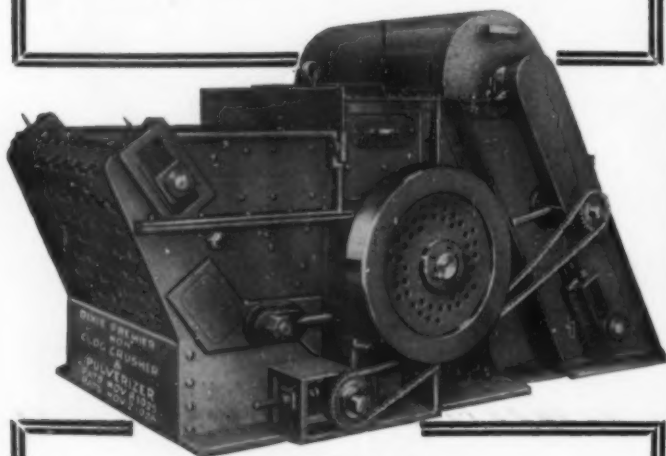
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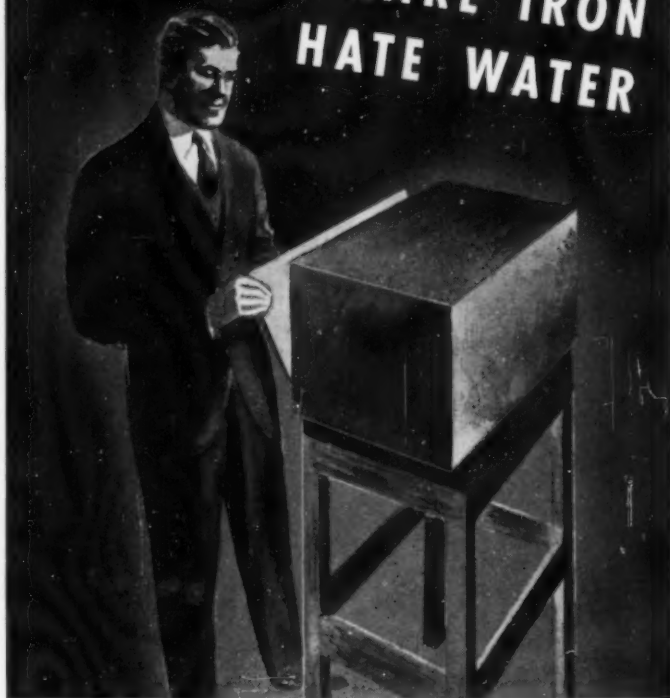
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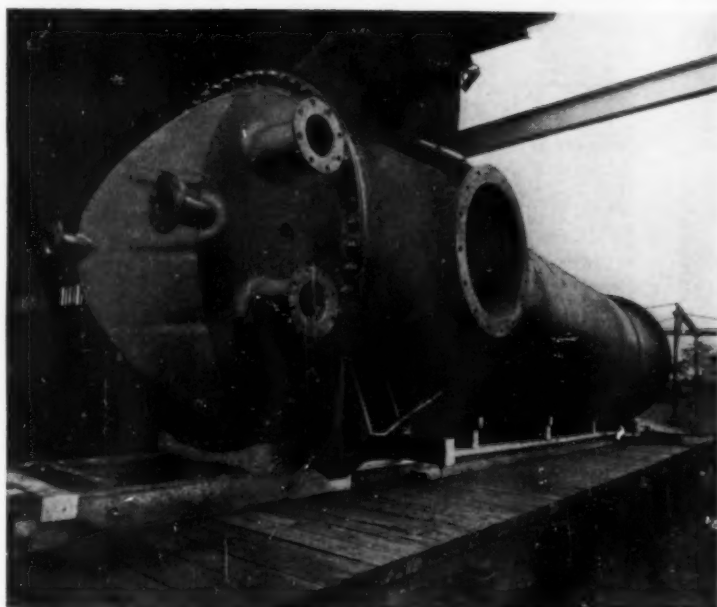


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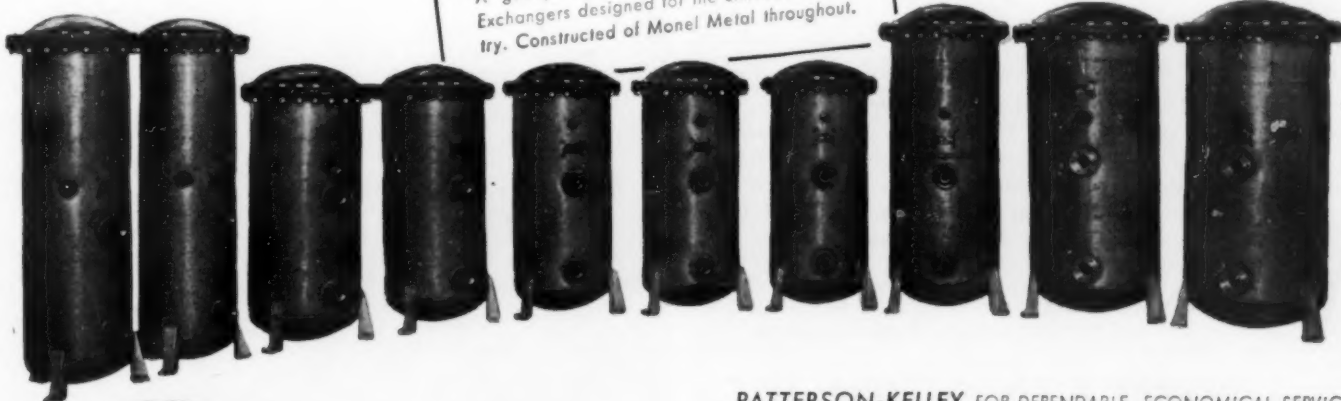
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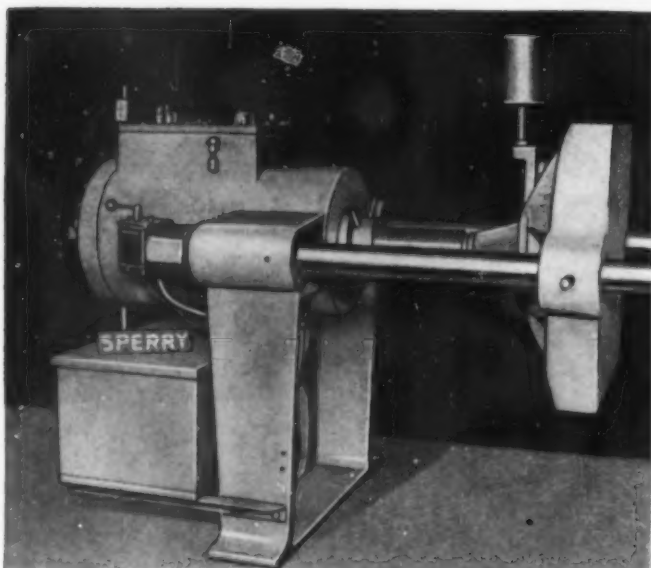


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2. THAT'S WHY TELLURIUM LEAD is so well-suited for such equipment. This new alloy laughs in the face of hot sulphuric and other acids. A high-temperature lead, it has great resistance to acid corrosion—even at temperatures approaching its melting point. Thus it helps equipment stand up longer—helps keep it on a 24-hour shift . . .



3. EQUALLY IMPORTANT, TELLURIUM LEAD *strengthens under stress*—actually “work-hardens”. Tough to start with, it gets *tougher* when hammered, rolled, bent or stretched. Thus joints and turnover points are less subject to cracking . . . buckling and creeping are minimized . . . and resistance is increased to vibration and to fracture from repeated temperature changes . . .



4. TELLURIUM LEAD COMBINES these important new advantages with the well-known properties of St. Joe chemical lead because it is a special alloy of this time-tested metal and Tellurium. Fabricated in sheets, pipes and coils, its use in vital industrial spots is helping Liberty's Arsenal “keep 'em rolling”.

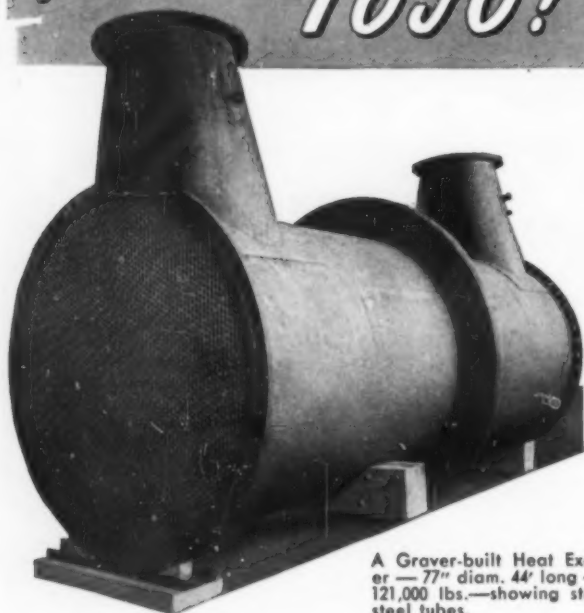
NATIONAL LEAD COMPANY—New York, Baltimore, Buffalo, Chicago, Cleveland, Cincinnati, St. Louis; National-Boston Lead Co., Boston; John T. Lewis & Bros. Co., Philadelphia; National Lead & Oil Co. of Penna., Pittsburgh; Georgia Lead Works, Atlanta; American Lead Corp., Indianapolis; Master Metals, Inc., Cleveland; The Canada Metal Co., Ltd., Toronto, Montreal, Winnipeg, Vancouver.



TELLURIUM LEAD

• A NATIONAL LEAD COMPANY PRODUCT •

*Putting the heat on
TOJO!*



A Graver-built Heat Exchanger — 77" diam. 44' long — wt., 121,000 lbs.—showing stainless steel tubes.

Guns and bullets — planes and tanks — shoes and toothbrushes — all the things that our fighting men need for Victory — are rolling off production lines in an ever increasing volume. The biggest job in history is being done — on time.

Our job is to supply industry with the steel plate equipment they need to carry out this gigantic production program — equipment such as this big heat exchanger made for a large builder of chemical plants.

Day in and day out Graver plants are turning out steel storage tanks, pressure vessels, solid stainless and stainless lined tanks, refinery equipment, bins, water conditioning equipment, and many other types of welded or riveted steel plate products.

Our customers today are those whose products are vital to victory. But when the job is done our experience and facilities will again be directed to the needs of a peacetime world.

GRAVER

STEEL STORAGE TANKS • WELDED CONSTRUCTION • STRESS RELIEVING
X-RAYING • FABRICATED STEEL AND CORROSION-RESISTING PLATE
VAPOR CONSERVATION SYSTEMS • WATER SOFTENERS • CLARIFIERS
FILTRATION SYSTEMS • SEWAGE EQUIPMENT

GRAVER TANK & MFG. CO., INC.

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EAST CHICAGO, IND.
CABLE ADDRESS — GRATANK

CHICAGO
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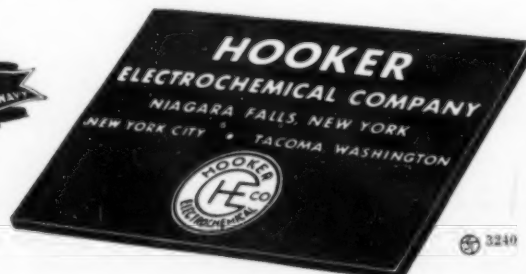


Two Chemicals Then Ninety Now

Two chemicals — Caustic Soda and Bleaching Powder — manufactured in the early days of HOOKER — have grown to ninety. Twenty of these were added to HOOKER production and sales during 1941 — and the list is still growing. This steady growth is a direct indication of chemistry's ever-increasing importance in the present war — and of HOOKER'S successful efforts to serve the Nation.

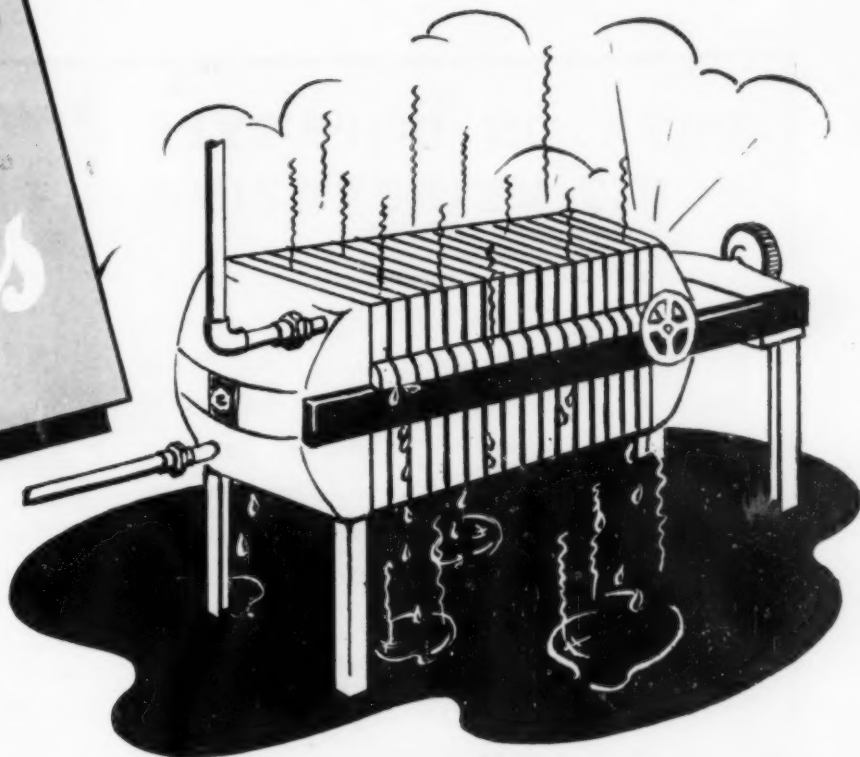
HOOKER Chlorine derivatives typify the wide range of chemistry's contribution to the war effort. Many are being used directly in the war effort, while others are used in the production of dental, surgical and other medicinal preparations, synthetic rubber, high-octane gasoline, rayon, and compounds for waterproofing and flame-proofing textiles.

The newest printed list of HOOKER products includes chemical formulas, descriptions, uses and shipping container data. Write for a copy.



3249

niagara filters
ELIMINATE
toxic fumes



Another

NIAGARA CASE HISTORY

One of America's largest chemical producers was recently selected by the Army to manufacture an essential organic solvent. To determine a practical process, a pilot scale operation was set up. Various processes and types of equipment were carefully tested and compared.

Due to the extremely toxic nature of the solvent fumes a totally enclosed system was required. This was simple up to the end of the process. Here it was necessary to dehydrate with calcium chloride and then filter out this solid.

A conventional plate-and-frame press was tried. But the fumes escaped and pressure caused leakage and loss of product as well as additional fumes. Operators had to wear masks in the filter room.

When NIAGARA filtration engineers were called in they promptly loaned a standard NIAGARA pilot plant model filter. Its totally enclosed, pressure tight construction quickly ended the hazard of both fumes and leakage—and it proved speedier and easier to clean as well!

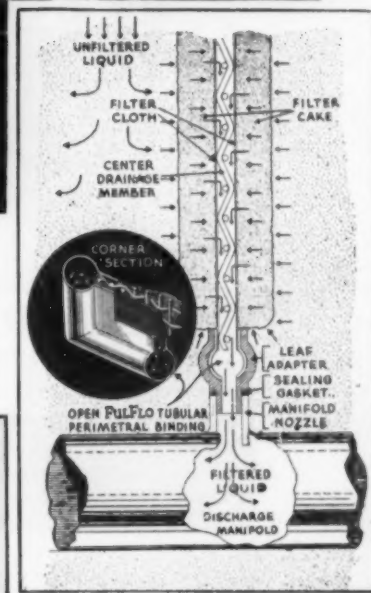
Perhaps you have a similar problem. NIAGARA pilot plant models and the "know how" of our filtration staff are at your disposal also—and without obligation.

This actual case history typifies the scope of NIAGARA engineering service—a service which goes far beyond the design and manufacture of filter systems for the process industries.

Our new three color booklet on NIAGARA Filter Systems is just off of the press. May we send you a copy?



Model 300 NIAGARA Filter, cut away to show vertical leaf arrangement. Detail is cross-section drawing thru single leaf, illustrating flow of unfiltered liquid thru each leaf.



niagara filter
CORPORATION

1432 NIAGARA ST.
BUFFALO, N. Y.

FILTRATION ENGINEERS TO

DATA ON DOPP-TYPE POSITIVE-SCRAPING

Basic information on heating and cooling various liquids and viscous materials, with and without Dopp-type positive-scraping, is given in our Discussion No. 3. Applications are checked on pilot plant scale as shown at the right. Resulting production economies include replacing a battery of Xanthate mixers with a single Dopp, drying in one Dopp instead of seven other units, saving 42% of the time for sulfonating, etc. As the first step toward your making savings with Dopps, let us send you Discussion No. 3.



Shows a test being made in Dopp Experimental Department where you can try a dozen different Dopp agitators operating under pressure or vacuum and at different speeds, heat with steam up to 150 lbs., cool with water or brine, etc.

These experimental facilities, offered without charge or obligation, may speed your change-over to wartime products.

DOPP CAST • SEAMLESS • SCRAPPED
MADE TRUE • STAY TRUE **KETTLES**



SOWERS MANUFACTURING CO., 1302 NIAGARA ST., BUFFALO, N. Y.

NEVILLE

We are now in production...

Dibutyl Phthalate

★ We solicit your inquiries

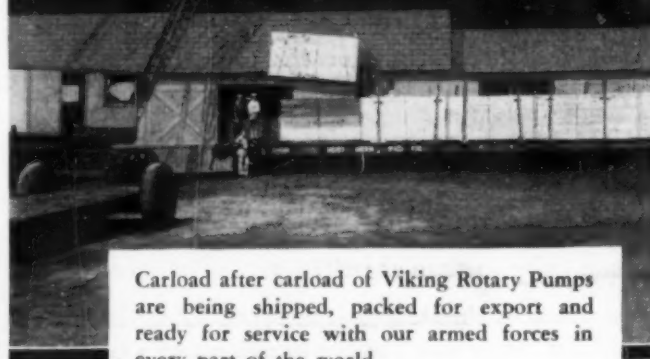
R-1

THE NEVILLE COMPANY
PITTSBURGH • PA.

Chemicals for the Nation's War Effort

BENZOL • TOLUOL • XYLOL • TOLUOL SUBSTITUTES • CRUDE COAL-TAR SOLVENTS
HI-FLASH SOLVENTS • PAINT-AND VARNISH REMOVERS • COUMARONE-INDENE RESINS
RUBBER COMPOUNDING MATERIALS • WIRE ENAMEL THINNERS • DIBUTYL PHTHALATE
TAR PAINTS • RECLAIMING, PLASTICIZING, NEUTRAL, CREOSOTE, SHINGLE STAIN OILS

THERE GOES YOUR PUMP...
To Help Our FIGHTING YANKS



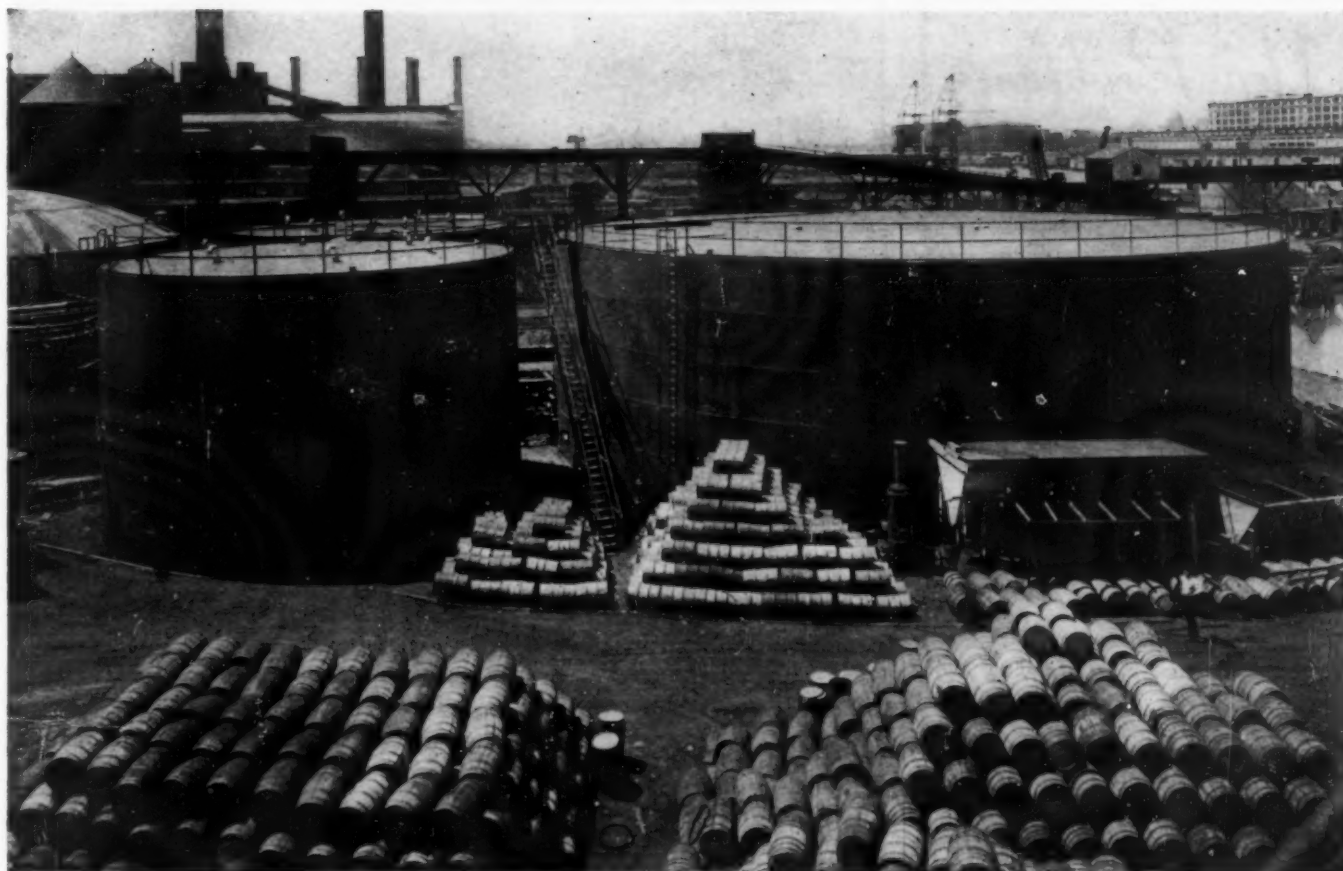
Carload after carload of Viking Rotary Pumps are being shipped, packed for export and ready for service with our armed forces in every part of the world.

Regular customers who are unable to get pumps at all . . . others who get them only after considerable delay . . . deserve a word of thanks for their patriotism and patience.

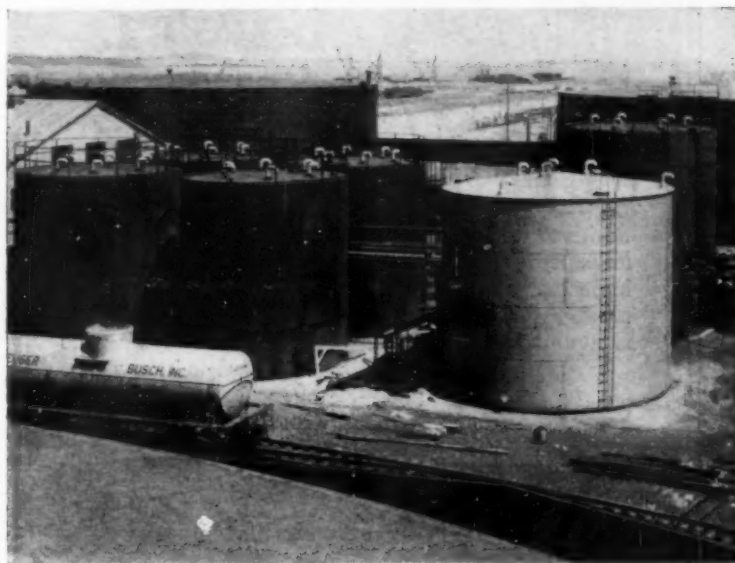
We're all doing the best we can. And there's one thing we're all agreed on. Equipment for our Fighting Yanks COMES FIRST . . . to speed Victory . . . so that our boys can get back home.



VIKING Pump COMPANY
CEDAR FALLS, IOWA



NOTHING SLOW ABOUT *"Molasses in January"* HERE



Top: Two 47½-ft. diam. and one 101½-ft. diam. molasses tanks at the Boston Molasses Company plant.

Directly Above: Four 22¾-ft. diam., one 30-ft. diam. and one 30½-ft. diam. molasses tank at Boston, Mass.



MOLASSES, high in vitamin and iron, is one of the "fighting foods" needed in huge quantities to sustain

United Nations fighting forces and civilian workers. Cooperating with the government's program to assure an adequate supply of such foods, this large east-coast molasses refiner undertook a plant construction program resulting in a modern streamlined storage, refining, processing and packing operation which is virtually automatic from the time tankers discharge their huge cargoes of raw molasses until the packaged products leave the plant.

The main storage facilities, consisting of eleven Horton flat-bottomed steel tanks, have a total capacity of approximately four million gallons.

CHICAGO BRIDGE & IRON COMPANY

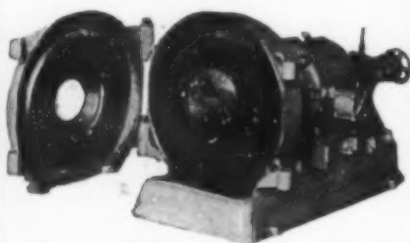
Chicago.....2124 McCormick Bldg.
New York.....3319-165 Broadway Bldg.
Havana.....402 Edificio Abreu
Philadelphia....1625-1700 Walnut St. Bldg.

Cleveland.....2220 Guildhall Bldg.
Birmingham....1510 North Fifth St.
Washington.....330 Bowen Bldg.

Houston.....5603 Clinton Drive
Tulsa.....1623 Hunt Bldg.
Greenville.....York Street
San Francisco....1022 Rialto Bldg.

Plants in BIRMINGHAM, CHICAGO and GREENVILLE, Pa. In Canada: HORTON STEEL WORKS, LIMITED, FORT ERIE, ONTARIO

New Problems Require New Solutions



Increased demands placed on the chemical and its allied trades have led to the adoption of various substitutes. These substitutes create new problems and new problems require new solutions.

The solution to many processing problems is available through the use of the SPROUT-WALDRON defiberizing mill illustrated above.

The defiberizing mill is being successfully used in defiberizing rags, alpha pulp, wood chips and many other materials that are being used in the War Production Program.

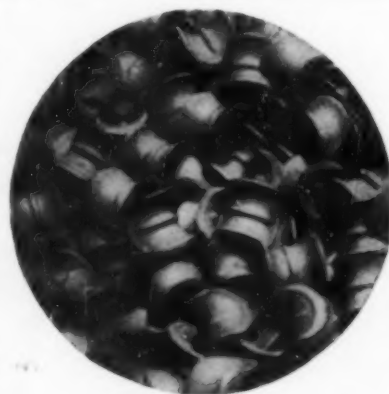
In addition to the above unit, SPROUT-WALDRON designs and manufactures a complete line of processing equipment for problems involving grinding, sifting, cutting or crushing. Send us details of your requirements in order that we may make a study of them and give you the benefit of our experience. In doing so you will not be placing yourself under any obligation.

Sprout, Waldron & Co.

(INCORPORATED IN 1895)

115 Sherman St. Muncy, Pa.

Engineers—Designers—Manufacturers
Since 1866



A MODERN "PLATE" COLUMN

Packed towers, using Berl Saddles, are proving to be of definite value in distillation operations. In addition to ease of installation, positive corrosion resistance and high flow capacity, they permit saving critical metals used in the conventional bubble cap plates for other use.

Berl Saddles offer more effective surface area, better distribution and less flow resistance than other types of ceramic packings. Investigate them for your next column for distillation or extraction, absorption, or scrubbing.

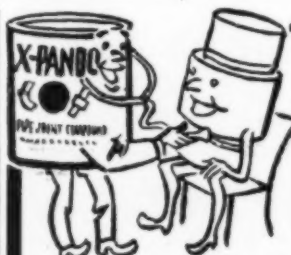
MAURICE A. KNIGHT

Kelly Ave.

Akron, Ohio

Your inquiry will have special value . . .

If you mention this magazine, when writing advertisers. Naturally, the publisher will appreciate it . . . but more important, it will identify you as one of the men the advertisers want to reach with his message & help to make possible enlarged future service.



CORRECTS IMPERFECTIONS in Threads and FLANGE FACES

Positive expansion after setting does more than end leaks permanently. It smooths flange faces and corrects imperfect or burred threads. In these days when piping is hard to get, this exclusive X-Pando Pipe Compound feature means that you can *repair* pipe joints you would ordinarily be forced to throw out. Get to know X-Pando—Ask your local mill supply house. There's an X-Pando distributor near you.

X-PANDO PIPE JOINT Compound

Expands as it sets. One formula for all uses. Goes 4 to 6 times further than ordinary compounds. Better than litharge and glycerin for all uses. Expands and contracts with pipe movement. Not affected by vibration, deflection, temperature or pressure. The perfect sealing compound.

See Your Local Mill Supply House—
Distributors Everywhere



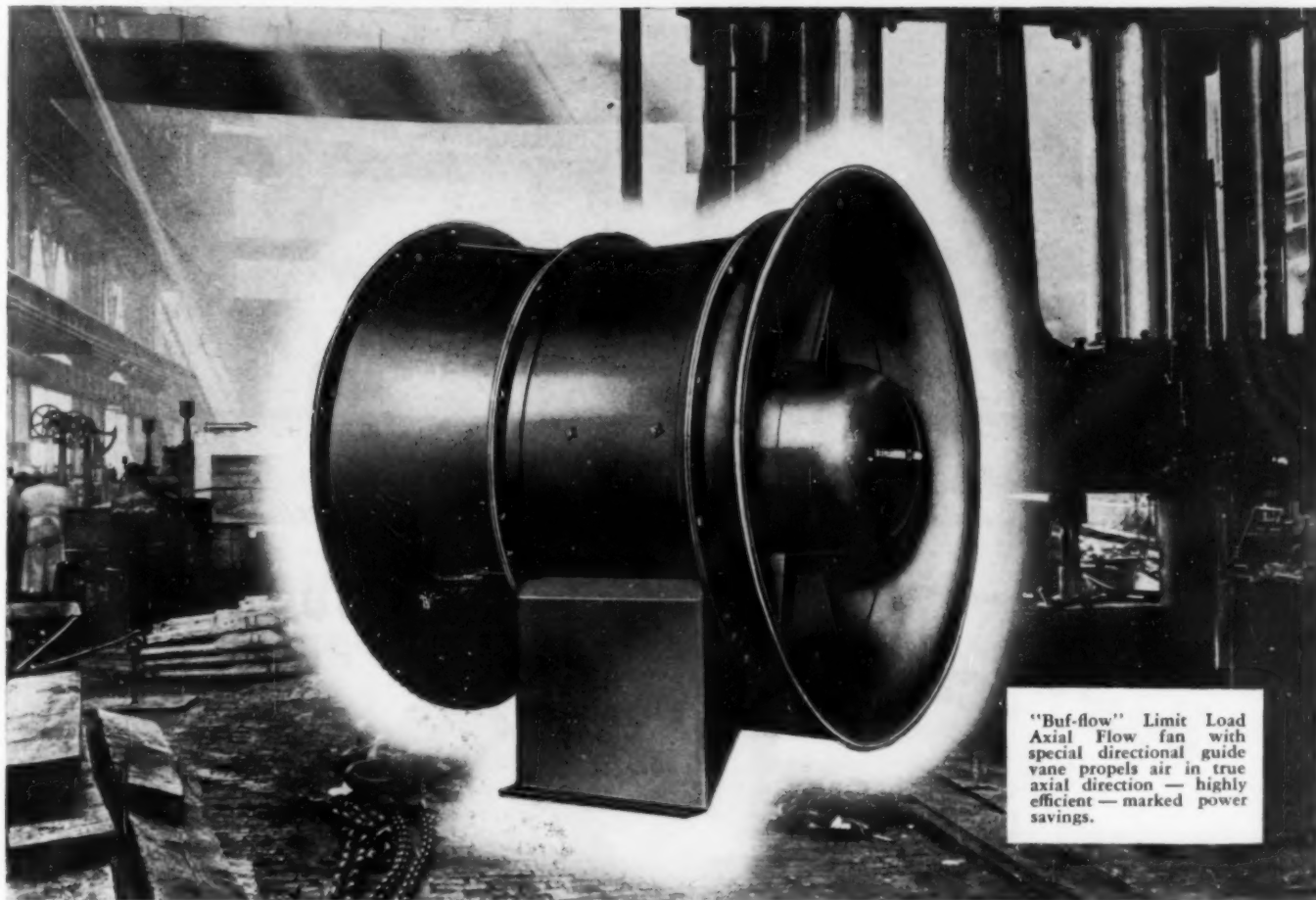
X-PANDO CORPORATION

43-15 - 36th Street • Long Island City, N. Y. • STilwell 4-7180

Canadian Distributors: La Salle Products Ltd. 158 Jean Talon St. W. Montreal, Quebec, Canada

The **AIR**, too,

is a vital "Raw Material"



Clean, fresh air is playing a vital role in helping forge out the armament for Victory . . . Air for ventilation . . . air for warmth . . . air for exhausting fumes and waste . . . air for boiler draft—in countless ways

Buffalo Fans are supplying air to maintain better workmanship and faster production. Engineered for sustained periods of continuous operation, Buffalo Fans serve quietly, economically and with a minimum of attention. In war, as in peace, industry safely relies on Buffalo!

BUFFALO FORGE COMPANY

501 Broadway

Buffalo, N. Y.

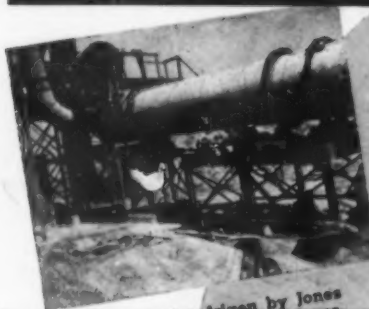
Branch Engineering Offices in Principal Cities

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

FANS FOR INDUSTRY

The next time you have a drive problem—



Rotary drier driven by Jones Herringbone Speed Reducer.



Jones Herringbone Reducer driving ball mill.

WHEN you have a drive problem that calls for a speed reducer, don't overlook Jones. All that we ask is an opportunity to present the features of Jones Herringbone, Worm and Spur Speed Reducers that have caused them to be selected for so many applications in process plants. The accompanying illustrations are typical of the Jones drives that are to be found in a wide variety of chemical plants, paper mills, paint, varnish, and plastics plants, and a host of similar applications.

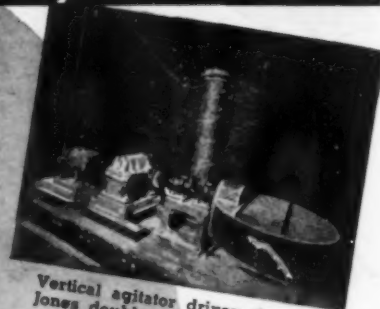
Before you decide on your next speed reducers, we shall appreciate the opportunity of assisting you in the selection of drives to meet your specific requirements.

W. A. JONES FOUNDRY & MACHINE CO.
4415 Roosevelt Road, Chicago, Illinois

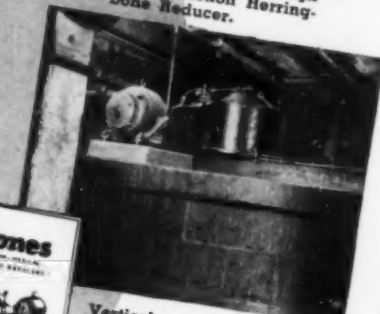
CATALOG NO. 70—Both standard and special applications of Herringbone Reducers are covered in this new catalog with technical information on applications.

BULLETIN NO. 75—Jones Worm-Helical Speed Reducers for vertical shaft drives, with rating tables, dimension diagrams, torque charts etc.

Copies will be sent on request.



Vertical agitator driven through Jones double reduction Herringbone Reducer.



Vertical agitator driven by Jones Worm-Helical Speed Reducer.

Jones

HERRINGBONE—WORM—SPUR—GEAR SPEED REDUCERS • PULLEYS
CUT AND MOLDED TOOTH GEARS • V-BELT SHEAVES • ANTI-FRICTION
PILLOW BLOCKS • FRICTION CLUTCHES • TRANSMISSION APPLIANCES

**Don't Scrap
USED
DART UNIONS**

**Put them
Back
to Work**

Your country needs all your scrap . . . but NOT the things that your plant can use again to good advantage, such as old Dart Unions.

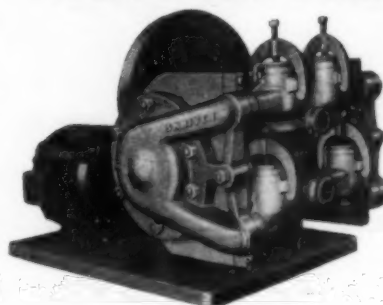
Even though a Dart has already given plenty of fine service, it can be put back on the job . . . with tight-joint performance. And the reasons why Darts can do this are found in the way Darts are MADE: their matched bronze seats, ground to "true-ball" surfaces . . . their air refined malleable iron bodies and nuts that resist rust and rough handling.

Today, you need your used Dart Unions—don't throw them away. And when you need new ones, get in touch with your supplier promptly.

E. M. DART MFG. CO., Providence R. I.



IF IT'S TOUGH STUFF Here's the Pump to Use



- **CORROSIVE or ABRASIVE SLURRIES**
- **HEAVY SUSPENSIONS**
- **THICK LIQUIDS**

- **POSITIVE ACTION**
- **NO PACKINGS**
- **NO CLOGGING**
- **NO LEAKAGE**
- **EASY TO CLEAN**
- **SUCTION LIFT UP TO 18 FT.**
- **DELIVERY PRESSURE UP TO 100 P.S.I.**
- **ANY METAL or RUBBER**

If you can't tolerate frequent breakdowns or worn out pumps handling difficult materials, then the Shriver Diaphragm Pump is the answer in uninterrupted service at low cost.

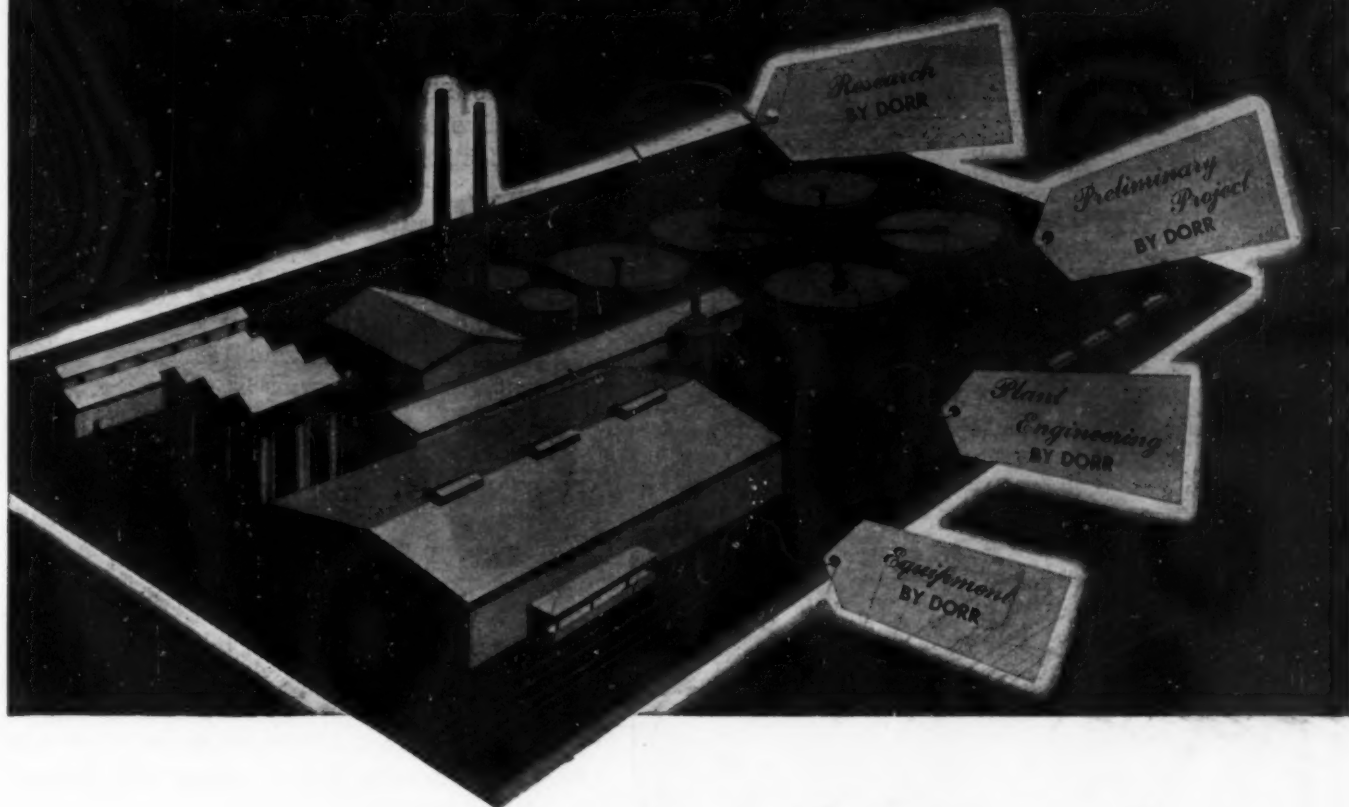
It's a double acting reciprocating type diaphragm pump delivering volumes at high pressures efficiently. The oil immersed working mechanism is entirely separated from the liquid heads. There is no wear on the mechanism and no expensive replacements. Capacities from 1 to 100 G. P. M.

Write for Bulletin No. 112 to T. Shriver & Company 802 Hamilton St., Harrison, N. J.

Shriver

DIAPHRAGM PUMPS

COMPLETE PLANTS



engineered by Dorr "know how"

For thirty-two years "know how" has been the basis for results produced by Dorr equipment—a "know how" founded firmly on the knowledge obtained from ever broadening applications, backed by a modern research laboratory.

Today, as a result of this experience we are engineering complete plants in those Chemical, Metallurgical and Industrial fields in which we have had specialized experience. This complete engineering consists of the four services of Research, Pre-

liminary Project, Plant Engineering and Equipment necessary to translate an idea into a plant in operation.

Research

Tests to determine method of treatment from the standpoint of efficiency, economy and grade of product required.

Preliminary Project

Preparation of diagrammatic and quantitative flowsheets. Estimates of

installed and operating costs of complete plant.

Plant Engineering

The complete design and specifications of the plant necessary for erection.

Equipment

The purchase of all equipment and the supervision of erection and initial operation.

DORR

— CONTINUOUS PROCESSING EQUIPMENT —

ADDRESS ALL INQUIRIES TO OUR NEAREST OFFICE

CHEMICAL & METALLURGICAL ENGINEERING • DECEMBER 1942 •



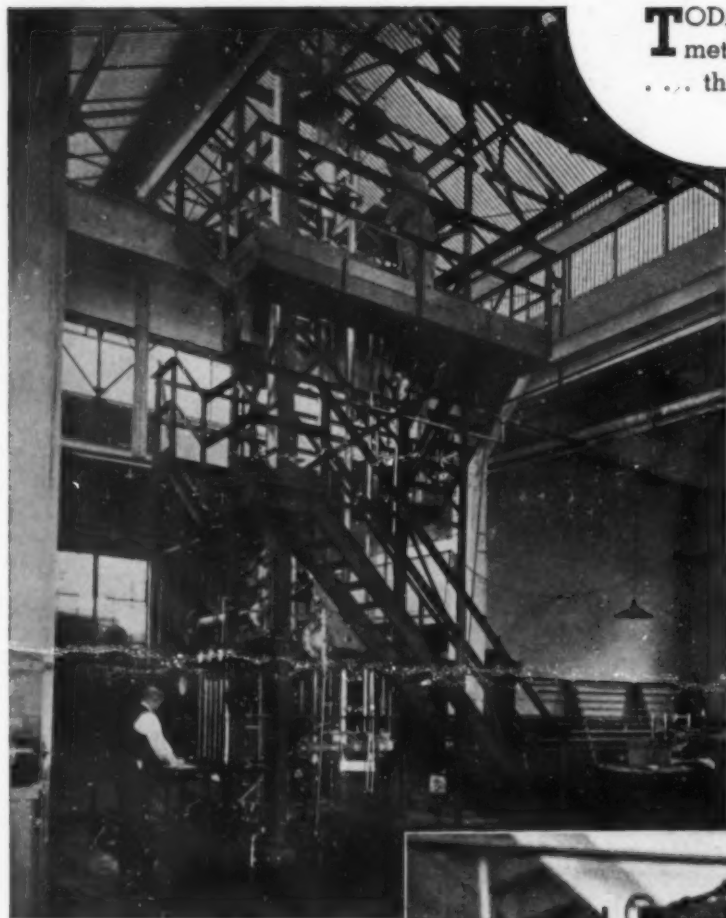
THE DORR COMPANY, INC., ENGINEERS

NEW YORK, N. Y. . . . 570 LEXINGTON AVE.
ATLANTA, GA. . . . CANDLER BUILDING
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SUGAR PROCESSING

PETREE & DORR ENGINEERS, INC.
570 LEXINGTON AVE., NEW YORK

Buflovak can help you with today's new processes and products

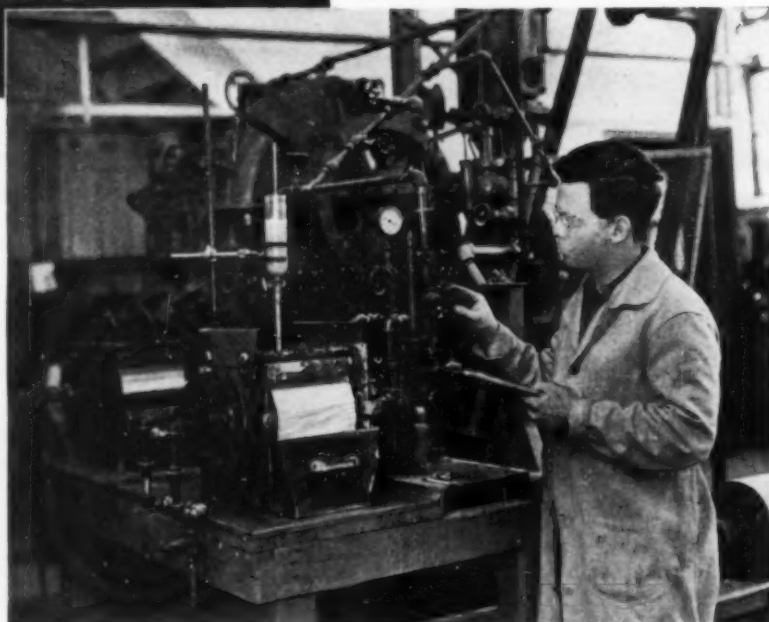


(UPPER)

Experimental Evaporator installed in the BUFLOVAK Research Laboratory. This unit is completely equipped with scientific instruments to study the various phases of evaporation. Materials can be evaporated on a semi-plant scale with accurate indexes of all resulting factors.

(RIGHT)

Atmospheric Double Drum Dryer, used in experimental drying tests with only small quantities of material. Equipment is also available for making subsequent tests showing accurate indexes on pilot-plant scale. The BUFLOVAK Laboratory is completely equipped with pilot plant units for drying, evaporation, impregnation, and other food and chemical processes.



TODAY, if you are faced with changes in processing methods, the BUFLOVAK Organization can help you . . . the same as we have helped other manufacturers.

To effectively assist you in developing new processes or new products to meet today's changed conditions, BUFLOVAK has again modernized their thoroughly equipped Research and Testing Plant. Here, practical methods on a semi-plant scale show positive operating results with accurate indexes to cost, capacity, and character of the finished product. These problems may include drying, evaporation, extraction, impregnation and solvent recovery.

A staff of highly specialized technicians will gladly share their experience of more than 30 years with you . . . or your own men may operate the equipment. In either case, results are always held in the strictest confidence.

These facilities can save both time and money in process development work by showing unmistakably, and right at the start, the operating results before substantial investments are made.



*Write
Today*



BUFFALO FOUNDRY & MACHINE CO.

1551 Fillmore Ave.

Buffalo, N. Y.

DRYERS..EVAPORATORS..PROCESS EQUIPMENT

THE WOOL IN EAGLE BLANKETS HAS VITAL EXTRA EFFICIENCY!



*Physically and chemically stable mineral wool does not deteriorate
... retains effectiveness at temperatures as high as 1200° F.*

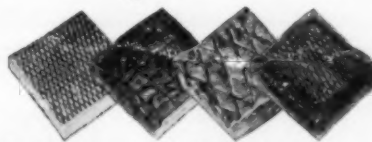
The unique properties of Eagle High Temperature Insulating Wool give extraordinarily low thermal conductivity to Eagle Insulating Blankets.

And because Eagle Insulating Wool is fire-resistant, water-repellent and non-disintegrating, the fuel conservation and production efficiencies which Eagle Blankets make possible, are maintained year after year.

Harsh service conditions and continuous temperatures as high as 1200° F. do not damage Eagle Blankets ... do not break down their effectiveness.

Application is fast and easy. Blankets are carefully felted and secured between layers of metal fabrics. Fabricated in large sections, 2' x 4' and 2' x 8'. Edges can be laced firmly together to form a tight, unbroken layer that is free from cracks and loose joints. Quickly cut on the job with tin shears to fit irregular areas or around obstructions.

Write today for catalog sheets giving full technical data and application techniques for Eagle High Temperature Insulating Blankets.



Made in both stiff and flexible forms. To meet various requirements, Eagle Blankets are made in several styles—both rigid and semi-rigid. Metal fabrics include wire mesh, expanded lath, stucco lath and rib lath.



Easily cut. Metal fabrics used in Eagle Blankets are strong and sturdy, but are readily cut on the job with sheet metal shears.



Continuous protection. When adjacent edges are properly laced together, all joints are tightly sealed, assuring full protection against heat loss.

Eagle-Picher High Temperature Insulations

Eagle Super "66" Plastic Insulation

Eagle Supertemp Blocks

Eagle L-T Felts

Eagle Blankets



Eagle Finishing Cements

Eagle Loose Wool

Eagle Insulseal

Eagle Insul-stic

THE EAGLE-PICHER LEAD COMPANY • CINCINNATI, OHIO

★ IMPROVE THE QUALITY OF YOUR COMPOUNDS WITH **DRYMET**

ANHYDROUS SODIUM METASILICATE

WHETHER you are compounding METAL, TEXTILE, DISHWASHING, LAUNDRY or GENERAL CLEANING COMPOUNDS, DRYMET will improve your quality.

- ... Speedier Action
- ... Noncaking quality
- ... Absolutely anhydrous
- ... Economical (saving package and transportation costs)

are just a few factors that you should consider. Write us today for detailed information pertaining to your particular job.

★ **CRYSTAMET**

Pentahydrate
Sodium Metasilicate

A pure, perfectly white, free-flowing granular product with the normal 42% water of crystallization. It can be used alone on medium pH jobs.

★ **DRYORTH**

Technically Anhydrous
Sodium Orthosilicate

A concentrated, trigger-action, high pH detergent silicate with excellent penetrating and wetting-out properties. It has speedy, dirt-loosening, prolonged suspending-emulsifying power.

THE COWLES DETERGENT COMPANY

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Cleveland, Ohio

Heavy Chemicals Department



PROTECT WEARING PARTS



WITH COLMONOY

Wash pipes, sleeves, plungers, seal rings and other parts that must resist acids, caustics and abrasion, will last longer when hard-faced with COLMONOY. Reclaim worn parts with proven COLMONOY Alloys. Write for catalog.

WALL-COLMONOY CORP.

720 Fisher Bldg., Detroit

Branches in New York City, Bismarck, N. Y., Chicago, Tulsa, Los Angeles and in Canada.

*Problem ...
Solution ...*



"H & B steam jacketed fittings, in semi-steel or cast steel, offer a simple solution to the problem of transporting high temperature liquids. All common and many special fittings in stock."



HETHERINGTON & BERNER INC.

ENGINEERS AND MANUFACTURERS

701-745 KENTUCKY AVENUE

INDIANAPOLIS, INDIANA





THE BARRETT DIVISION

This new 36-page, pocket-sized booklet lists the many important Barrett Chemicals and provides a finger-tip reference which gives concise descriptions and uses of each product. We will gladly send you a copy on request. No obligation.

SPEED— COMES NATURAL TO ESOTOO*

In many processes ESOTOO* can save time — reduce costs — speed up production — because it cuts man-hours—delivers clean, cool 100% SO₂ to the process—helps to prevent undesirable side reactions and assures positive control and simplified operation.

A relatively short haul to many of the country's largest industrial centers adds the very important advantage of prompt delivery from the strategically located works of the Virginia Smelting Company.

*"ESOTOO" is Virginia's Trade Name for Liquid Sulfur Dioxide



**VIRGINIA SMELTING
COMPANY**
WEST NORFOLK, VIRGINIA

About Shipments—



Portable cylinders containing 150 lb., semi-portable drums containing 2000 lb. liquid SO₂. L. C. L. or carload.



Carload: 15 drums on multi-unit car frame; 30,000 lb. For users without storage facilities.

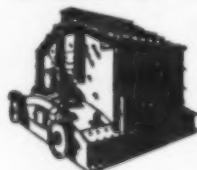


Tank car lots of 40,000 lb. for users equipped with storage facilities.



Prompt shipment from the strategically located works of the largest producer of liquid sulfur dioxide in the U. S.

"PENNSYLVANIA" CRUSHERS



HAMMERMILLS

The Central Feed **REVERSIBLE** is the most outstanding advance in Hammermill design in 20 years. **REVERSIBILITY** is an exclusive "Pennsylvania" feature. For Limestones, Cement Rocks, Gypsums and wide variety of Chemicals and Industrial Minerals. Automatic hammer turning. Adjustable Cages . . . Tramp Iron protection. 25 to 500 T.P.H. Steel built. Patented.



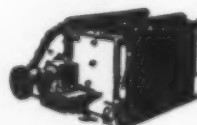
"IMPACTORS"

An advanced, new type that reduces by direct impact. For high Silicas, Clinkers, Slags, Chrome and Manganese Ores, Furnace Refractories, etc. Make "cubbing" particles shape, not "slivery". Several sizes. Patented.



SINGLE ROLLS

An advanced design, specialized for Coal Preparation in Mines, Cleaning Plants, Gas Works and Power Plants. Sizes for Chemicals and Industrial Minerals. Automatic Tramp Iron Protection, quick adjustability from 1/2" to 8" sizing. Powerful Steel built construction. Patented.



"GRANULATORS"

Granulate materials of medium hardness . . . Bituminous coal . . . Gypsum Rock, etc., to product sizes 1/2" to 2", with minimum fines and oversize. Operation practically dustless. Steel built. Patented.



BRADFORD BREAKERS

Reduce R.O.M. for Stoker or Pulverizer feed with absolutely no oversize and low "overgrinding". Crush by gravity impact. Automatically eject, without damage, tramp iron, mine debris and hard rock. Low H.P. . . slow speed . . . long life. Low up-keep . . . rugged . . . thoroughly dependable 25 to 500 T.P.H. Steel built. Patented.

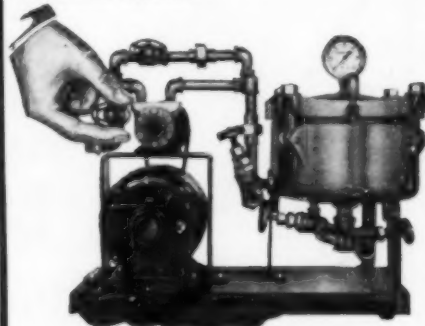
Bulletins are available to interested parties

PENNSYLVANIA CRUSHER CO.
1700 Liberty Trust Bldg. PHILADELPHIA, PA.
New York Pittsburgh Chicago Los Angeles Birmingham London

GET THE MOST! From Your Liquids.

REFINE, CLARIFY and RESTORE them with SPARKLER HORIZONTAL PLATE FILTERS

Whether your filtering job involves the lightest chemicals or the heaviest waxes, there's a Sparkler designed especially for your particular product.



LABORATORY SIZE

A series of horizontal plates are clamped together with filter paper between, making cleaning and changing easy. All types of filteraids, bleaching clays and diatomaceous earths are exceptionally effective.

Sparkler Filters can be reset or changed in less than three minutes, have plenty of cake space, are simple to operate, inexpensive to own and maintain. Capacities

1 pint to 10,000 G.P.H. We will gladly demonstrate the Sparkler in your own laboratory, or send us sample of your unfiltered product for test.

SPARKLER MANUFACTURING CO.
237 Lake Street MUNDELEIN, ILLINOIS

SPARKLER FILTERS
WITH THE HORIZONTAL PLATES

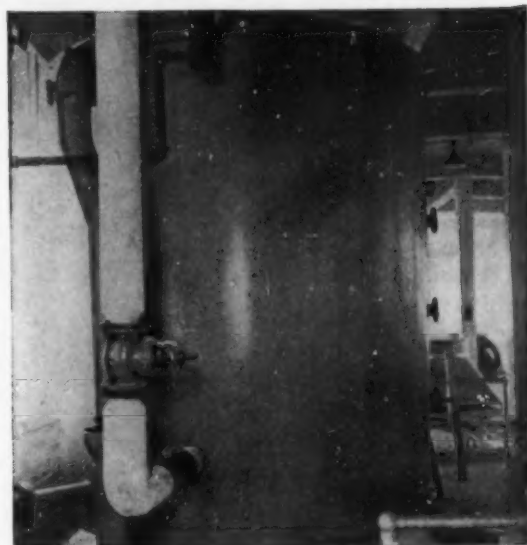
Save VITAL NICKEL INCONEL OR MONEL

**By Making 1 Pound
Do the Work of 10!**

By use of Lukens Clad Steels, all the benefits of the corrosion-resisting qualities of nickel, Inconel and Monel may be enjoyed with a great saving in the actual amount of these metals used. This saving usually runs about 80% to 90%—sometimes even higher.

Equipment made from Lukens Nickel-Clad, Inconel-Clad or Monel-Clad Steel resists corrosion—hence gives long service with a minimum of care. It protects products against harmful metallic contamination.

If you have any corrosion problem that nickel, Inconel and Monel can solve, you may solve it better today with Lukens Nickel-Clad, Inconel-Clad and Monel-Clad Steels.



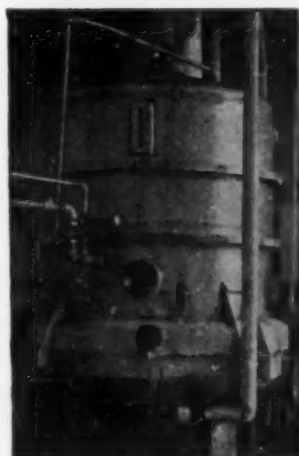
CIGARETTE PAPER Lukens Nickel-Clad Steel keeps water rust-free in this tank 8' 0" inside diameter and 9' 0" high, for heating and holding hot water in the bleach building of a cigarette paper plant. Fabricated from 1/4" thick and 3/16" thick 10% Lukens Nickel-Clad Steel by Greenville Steel and Foundry Company, Greenville, South Carolina.



IMPORTANT CONSERVATION Three chemical reaction tanks, fabricated by Steel and Alloy Tank Company, Newark, N. J., from 20% Lukens Nickel-Clad Steel. Had solid nickel been used, nearly 37,000 pounds of this vital metal would have been consumed, instead of about 7,000 pounds.

MEDICINAL EXTRACTS

This evaporator pan, 5' 5" in diameter and 5' 2" deep, for handling crude extract of liver and meat, was fabricated of 10% and 20% Lukens Inconel-Clad Steel by Richmond Engineering Co., Richmond, Va., for Valentine's Meat Juice Co., Richmond.



HOTSALT The two pans of these electric vibrating feeders handling dry salt at a temperature around 180° F., were constructed of 5/16" thick, 20% Lukens Monel-Clad Steel by The Jeffrey Manufacturing Company, Columbus, Ohio.



LUKENS STEEL COMPANY • World's Largest Plate Mill • 176 LUKENS BUILDING • COATESVILLE, PA.



This bulletin gives tables of recommended applications of Lukens Clad Steel equipment according to industry and chief corrosive agent. Over 125 illustrations. Ask for it or company letterhead

HERCULES Carboy BOXES

"Just drop it in—it's Packed!"

PACK ONE A MINUTE!

Make the war minutes count. Standardize on Hercules Carboy Boxes for fast packing.

No skilled men required. Just drop the bottle in, nail down the top,—it's packed and protected for long service by Hercules resilient but strong construction. Cork cushions are quickly replaced and interchangeable.

Leading chemical shippers have used Hercules for years, and now more than ever!



ICC-1A, in 5 and 13 gallon or special sizes.

We also make Multiple Bottle Boxes—any size, any type, special and standard.

**Specialists
for 35 years.**

NATIONAL BOX & LUMBER CO.
NEWARK • NEW JERSEY

✓ *check substitute materials*



with

Taber ABRASERS

New, more accurate technique for testing wear resistance of surface finishes and sheet material is now possible with Taber Abrasers.

Scientific wearing action by "Calibrase" wheels is automatically totalled on built-in wear cycle counter.

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Designers and Builders of Precision Scientific Apparatus

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Featuring additional Equipment Materials and Supplies for the Process Industries

New LaMOTTE MICRO pH TESTING SET

A micro unit for pH determinations with facilities never before offered in the colorimetric system.

pH range of standard unit 5.2 to 8.4.

Requires less than 0.5 cc. sample.

Accuracy ± 0.1 pH.

Turbidity and color in sample does not affect result.



Full information will be sent on request.

LaMotte Chemical Products Co.
Dept. M Towson, Baltimore, Md.

NEW "SEARCHLIGHT" ADVERTISEMENTS

received by December 30th appear in the January issue, subject to space limitations.

Address copy to the
Departmental Staff

Chemical and Metallurgical Engineering
330 West 42nd St., New York City

WYCKOFF REDWOOD PIPE

Clear California Redwood pipe has greater carrying capacity than metal or concrete weight. Easily installed. No affected by pipe. Does not clog, scale or pit. Light electrolysis, worms, frosts and resists heat. Use it for sewage, liquors, acids, water, heavy fluids containing grit—for flumes, fume ducts, etc. Sizes 1" and up. Pressures at 172 lbs. We also manufacture Redwood Underground Steam Pipe Castings. Lengths up to 12 ft.

A. WYCKOFF & SON CO.

Office & Factory—12 Home St., Elmira, N. Y.
Originators of Machine Made Wood Pipe
1855—Our Eighty-Sixth Anniversary—1942



**FEED
MATERIAL
BY
WEIGHT**

THE MERRICK FEED-O-WEIGHT

MERRICK SCALE MFG. CO.
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ACID AND ALKALI PROOF LININGS AND MORTARS

**ACID PROOF
CONSTRUCTION**

THE CEILCOTE CO.

Consulting and Research Engineers
750 ROCKEFELLER BLDG.
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Asbestos Pads, Filter Cloth, Filter Paper, Activated Carbon, Asbestos Fibre and Filter Aids. Write Today for Free Samples.

Complete stock of Filtering Equipment, Stainless Steel and Glas-Lined Tanks, Easy-Ride Conveyors, for Immediate Delivery. Write for Folders.

THE FILTER PAPER CO.
56 E. Twenty-Fourth Street, Chicago

AIR BORNE

CAN COME INSIDE

INDUSTRY, TOO!

The special targets of enemy airmen are manufacturing plants—for here, at the sources of production, battles are often won or lost before actual combat begins. So every effort is made to protect these plants where the materials of war are made . . . camouflage and blackout, anti-aircraft batteries, even balloons swaying on leash in the sky help to keep enemy air forces from coming too close.



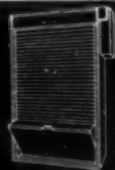
The enemy *without* is not the only destructive force against which industry must be protected. Dust—like enemy bombs—dangerous and destructive, but much more insidious in the way it attacks—is the air-borne menace that strikes at industry from *within*.

Air filters and dust control units especially engineered for chemical manufacturing needs have made an outstanding contribution to the chemical industry's war effort. Among the AAF units designed for chemical use, is the Roto-Clone which may be had in either the Type W (wet collector) which deposits the collected dust in the form of sludge, or the Type D (dry collector) which collects dusts not suitable for wetting. Where the dust has salvage value, Roto-Clone has effected material savings in addition to eliminating the dust hazard. Write us for descriptive bulletins.

AMERICAN AIR FILTER CO., INC., 326 CENTRAL AVE., LOUISVILLE, KY.

INCORPORATED

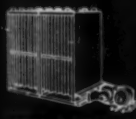
In Canada: DARLING BROS., LTD., MONTREAL, P. Q.



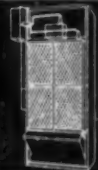
SELF-CLEANING AIR FILTER



AIRMAT DRY FILTER



AIRMAT DUST ARRESTER



ELECTRIC PRECIPITATOR



ROTO-CLONE PRECIPITATOR

Thousands of PROCTOR DRYERS

In over 60 years of designing and building drying machinery for a wide variety of materials, Proctor & Schwartz has built thousands of super efficient industrial dryers and has become known as the world's largest builder of this type of equipment. For some idea of the scope of this organization's experience in solving varied drying problems with maximum efficiency, ask for Bulletin No. 158.

PROCTOR & SCHWARTZ, INC.
PHILADELPHIA

Tank Builders For Over 80 Years!



Cole Creosoting Cylinder 8' diameter x 138' long

High Pressure Vessels of Quality Steel

When in need of tanks and vats for acid storage, NaOH storage, etc., agitation tanks, bubble towers, gas scrubbers, creosoting cylinders and other heavy pressure vessel and fabricated work call on COLE. "Custom-made" to order in plain and Alloy steel, Nickel-Clad and Stainless steel Monel metal, lead lined, tin lined, aluminum, etc. Other COLE products are:

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| Tanks | Kiers | Welded Steel Pipe |
| Towers | Kettles | Digesters |
| Standpipes | Vats | Storage Bins |
| Smokestacks | Air Receivers | Fabricated Framework |
| | Boilers (HRT and Manning) | |

Our Engineering Department will submit designs or any equipment may be made from your own specifications.

Write for "Tank Talk"—No. 13-B

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ESTABLISHED 1954
NEWNAN GEORGIA

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The Trend Toward Economy—

The service of the consulting engineer is a real economy. With his knowledge of organization and production problems and his wide and varied experience, he can usually reveal the points of waste and inefficiency that are costing you money and suggest inexpensive means for their elimination.

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22 E. 40th St., New York

FOSTER D. SNELL, INC.

Our staff of chemists, engineers and bacteriologists with laboratories for analysis, research, physical testing and bacteriology are prepared to render you

Every Form of Chemical Service

309 Washington Street Brooklyn, N. Y.

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10 cents a word, minimum charge \$2.00

(See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), 1/2 above rates.

PROPOSALS, 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

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The advertising rate is \$6.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured 7/8 inch vertically on one column, 3 columns—30 inches—to a page. C&M

NEW ADVERTISEMENTS received by 10 A. M. January 4th will appear in the January issue subject to limitation of space available.

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and
DRAFTSMEN

Write or Apply in Person

ALUMINUM CO. OF AMERICA

PLANCOR PLANT

Postoffice Box 210 Massena, N. Y.

WANTED IMMEDIATELY MECHANICAL OR CHEMICAL ENGINEER FAMILIAR

With the Copper-smithing Industry in all its branches by West Coast Corporation. Applicant must be capable of handling men, familiar with tools, dies, patents, shipbuilding pipe design, distillation, drafting, heat exchange, etc.; State age, salary open.

P-430, Chem. & Met. Engineering
68 Post St., San Francisco, Calif.

POSITIONS VACANT

ENGINEER WANTED to serve as production manager of storage battery factory. Well rated firm. Fine opportunity for capable, steady man. Please give qualifications, experience, age, dependents, and earnings for past several years. Standard Electric Co., Route 3 Box 121-B, San Antonio, Texas.

CHEMIST with thorough basic knowledge of alkylid resin and associated products manufacturing. Production experience wanted but not required. This opportunity is not a defense job primarily, and may be considered as permanent to the right man. Location northwest side of Chicago. P-460, Chemical & Metallurgical Engineering, 520 N. Michigan Ave., Chicago, Ill.

METALLURGIST—Well qualified man, who has had extended experience with stainless, tool, and alloy steels. Must be able to assume responsibility and direct laboratory organization. Excellent opportunity for properly qualified man. P-459, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

AN ENGINEERING CONSTRUCTION COMPANY, with long experience in Spanish America, is starting an Export Department and needs an experienced Chemical Engineer familiar with the design and operation of heavy chemical plants, particularly caustic soda and cyanide. Headquarters in New York City and to also spend considerable time in South America. Most advisable that he speak Spanish. P-447, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

CHEMIST WANTED for development and production work in chemical pigments. Permanent position for man with ability and initiative. Only men in 3A draft classification need apply. P-457, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

MANUFACTURING EXECUTIVES and Technical men, Chemists and Metallurgists—Immediate openings throughout country. Salaries \$2500 to \$20,000 year. Write for application. Confidential. Established 27 years. Harrison Personnel Service, 20 W. Jackson, Chicago.

SALARIED POSITIONS — \$2,500 to \$25,000. This advertising service of 33 years' recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been \$2,500 or more send for details. R. W. Bixby, Inc., 260 Delward Bldg., Buffalo, N. Y.

POSITIONS WANTED

POSITION Wanted by man with ten years experience in administration and research in water chemistry and biology. M.S. degree, three years graduate study, 32 years old, married, and class 3 draft status. At present employed in war industry but the training and experience is not being used to best advantage of war effort. Work must be in a war industry. PW-455, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

POSITIONS WANTED

CHEMICAL AND MECHANICAL Engineer wants position as project engineer or in plant development. Will also consider production supervising. Two years experience in production control in soap manufacture. Three years replacement and expansion project engineering. Now employed as engineering and priority advisor by one of country's largest chemical companies. M.I.T. graduate, 4F. PW-456, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

CHEMICAL ENGINEER: Thoroughly qualified by 26 years experience in plant supervision, process development, laboratory control in the mass production of heavy chemicals, metal and other specialties, and ceramics. Possess comprehensive detail in use of equipment peculiar to such plants. Now employed in California developing metallurgical recovery process. Desire more permanent Pacific Coast connection which permits utilization of my extensive experience. PW-458, Chemical & Metallurgical Engineering, 69 Post Street, San Francisco, Cal.

EXECUTIVE CHEMICAL ENGINEER—Draft Status 3A, 35 years, good health. Experience—5 years Executive Management. Work having full responsibility for maintenance repairs, operation processing and bulk handling equipment, besides purchasing, shipping, personnel, construction 4 years major oil refinery process development research and plant control. Six years Engineering Course major university able to assume responsibility. PW-463, Chemical & Metallurgical Engineering, 520 N. Michigan Ave., Chicago, Ill.

FREE BULLETIN

HIRSCH MACHINERY COMPANY'S new catalog is a 4-page folder listing many items of used equipment. Write direct to them at 429 Frelinghuysen Avenue, Newark, N. J. for a copy.

WANTED

RAW MATERIALS—Highest prices paid for any quantities standard, damaged, or off-grade salicylic acid, acetylsalicylic acid, and any other salicylic derivatives including salicyrides. Indicate quantities and location of any quantities for immediate purchase. W-448, Chemical & Metallurgical Engineering, 330 W. 42nd St., New York, N. Y.

LABORATORY CALENDER wanted. Urgently needed for use in connection with vital war work. W-461, Chemical & Metallurgical Engineering, 520 N. Michigan Ave., Chicago, Ill.

Consulting Engineers-Project Management Petroleum Refining and Chemical Industries

Completing present projects in December soliciting new contracts covering processing, estimates, design, procurement of equipment, construction and operation. Principals only.

WW-439, Chem. & Met. Engineering
330 West 42nd St., New York City

PAINT and VARNISH PLANT

Wanted to buy or rent idle or partly busy plant with modern equipment in New York Metropolitan area. Send full particulars to

BO-454, Chem. & Met. Engr.
330 West 42nd St., New York City

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Now employed. Age 39, married, graduate chemical engineer, good organizer, excellent record, wide background process equipment and process industries. Desires more responsible position with opportunity developing present and post-war business. Only interested in proposition requiring genuine ability with proper remuneration for initiative, ingenuity and successful work. Every man has his price . . . mine is \$10,000. per year.

SA-462, Chem. & Met. Engineering
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FOR SALE

Fletcher Works 40" Centrifugal Drier—lead lined, with motor 3 phase, 24 amp., 600 RPM, full load 2-speed.

Acid proof bronze drain table and drip pot.

Mother liquor lead lined tank 6'-0" diameter, 5'-0" height.

Saturator lead lined, 5'-0" diameter, 13'-8" height.

Acid feed tank 4'-6" diameter, 8'-6" height.

Acid Separator 2'-2" diameter, 4'-0" height.

For details write to

BATTLE CREEK GAS COMPANY

36 E. Michigan Avenue
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FACTORY RECONDITIONED

"PENNSYLVANIA'S"

2—SK-4 Hammermills STEELBUILT
3—18"x24" Single Rolls STEELBUILT
1—21"x40" Single Roll STEELBUILT
These units are available on low Priorities. Prompt shipment.

LET US KNOW YOUR REQUIREMENTS.

Pennsylvania Crusher Co., Phila., Pa.

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BOUGHT, SOLD, REFINED
Platinum & Precious Metal Scrap

I. MILLER, INC.

304 Colonial Arcade Cleveland, O.

ROTARY DRIERS WANTED

Large distiller wants three 4' or 5' diameter x 25' to 30' long rotary steam tube driers and presses. Louisville preferred. Give full particulars first letter.

W-453, Chem. & Met. Engineering
330 West 42nd St., New York City

WANTED

KETTLE

200 to 400 gal. kettle, glass lined, stainless or nickel. Either jacketed or with internal coils. Quote price, manufacturer and serial number.

W-444, Chem. & Met. Engr.
330 W. 42nd St., New York City



AWARDED TO OUR CUSTOMERS

We didn't get them—but we helped to earn them

We are proud of the help "Consolidated" has contributed toward the award of the Army-Navy "E" to many of our customers. Their thanks to us cannot be accepted without gratefully acknowledging the co-operation of all those who supplied us with the vitally needed idle production equipment that we were able to furnish these cus-

tomers and thus make their outstanding production possible.

We appeal to ALL our customers—**MOBILIZE** any usable machines not now in service. Our resources and facilities will quickly place them where they will help in the war. Rush us a list of what you have for disposal.

WE HAVE URGENT CALLS FOR THIS EQUIPMENT

Agitators
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Blowers
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Crystallizers
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Evaporators
Extractors

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Powder
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Kettles
Kilns

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sizes
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Direct Heat

- 1—5' x 30' Iroquois
- 1—6' x 24' Iroquois
- both 1/2" shells and complete

- 4—300 gal. PFAUDLER WATER JACKETED KETTLES, side m.d. agitators; 1—125 gal.
- 10—300 gal. COPPER CLOSED TIN-COATED TANKS.
- 1—ALUMINUM TRUCK TANK, 1100 gal., 10' 4" long.
- 60—25 gal. Monel open tanks; 12—45 gal.
- 18—RUBBER LINED Rectangular TANKS; 1—2200 gal.; 2—1000 gal.; 2—650 gal.; 9—500 gal.; 2—200 gal.; 1—150 gal.
- 10—American Tool 40" steel basket CENTRIFUGALS, bottom discharge.
- 35—CENTRIFUGAL EXTRACTORS, 12" to 72", bronze and steel baskets, belt and motor drives.
- 10—EVAPORATORS—single, double, triple and quadruple effects, standard makes.
- 1—100 gal. ALUMINUM JACK KETTLE; 2—80 gal.; 1—60 gal.; 2—40 gal.; 1—20 gal.
- 8—PEBBLE MILLS: 1—Patterson, 6'x7' Silex Lined; 1—32"x42" rubber lined; other sizes.
- 4—VIBRATING SCREENS: TYLER HUMMER 4'x5' No. 33.
- 5—RAYMOND PULVERIZERS; 5 Roll High Side; No. 1 Beater Type; No. 0000.

Overhead Electric Traveling Cranes

- 1—5 ton P & H 3 motor OET crane, 47' span, 25' lift with 60' runway and legs
- 1—2 ton Lakeside 3 motor 47' span, 25' lift, 330' steel runway
- 1—2 ton American monorail, 3 motor, 25' lift, 60' span
- All motors 3 ph. 60 cy. 440 V. These cranes are still in service and can be seen in operation.

Case History No. 1

W. P. B. OFFICE received an urgent call for a Heavy Duty Mixer for Synthetic Rubber research. We had a suitable W. & P. 100 gallon jacketed mixer and could ship within a few days.

The W. P. B. requested Mixer be shipped that same day. We put on a special force to clean, overhaul, prepare for shipment. Mixer was ready at 11 P.M. Trucking Company loaded machine at midnight; delivered it in New England at 7 next morning.

Case History No. 2

A Customer in the Middlewest telephoned for a 12 Truck Dryer. We had a suitable unit in stock. It would have taken as much as 4 months to build a new one. We set machine up in our own shops, checked it for completeness and operation, then dismantled, packed and shipped. It arrived within 10 days of the time it was ordered.

Furthermore, one of our mechanics accompanied the shipment. By being on the premises, he saved the customer many hours in its re-erection.

BELT CONVEYORS: 24"x105'; 30"x132'. Also 2—18" with Belts Ball Bearing Idlers, steel frame work, drives, etc. 120', 125', all c.c.
1—W & P Mixer size 18, 500 gal., jacketed, type VIM Class CC; 7—size 15, 100 gal., jack., type VI, Class BB; and other sizes.
9—KELLY FILTERS, #150, #250, #450.
12—OLIVER FILTERS, 4'x6', 6'x6', wood and iron; 8'x8', 8'x12.

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Former LION BREWERY

108th St. & Columbus Ave.,
New York, N. Y.

- 3—Vilter AMMONIA COMPRESSORS, twin horiz., 250 tons each direct motor driven to West. 500 HP synchr. Motors, 3/60/440 V.
- 1—Vilter AMMONIA COMPRESSOR, 40 tons, motor driven with West. 100 HP 3/60/440 V.
- WOOD TANKS, good as new—
- 75—Open and Closed, 5,000 to 13,000 gal.
- 32—Horizontal, 10' dia. x 23' long, 3" staves, 14,000 gallons.

BREW EQUIPMENT

BOTTLING EQUIPMENT

Miscellaneous: 8,000 gal. Jacketed, Agitated Kettles, Boilers, Pumps, Keg Equipment, Rubber Tubing, Tons of Pipe, Valves and Fittings.

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- 2—All-copper EVAPORATORS: 1—Badger Triple 450 sq. ft. per effect; 1 standard triple 450 sq. ft. per effect; 1—Standard Triple 350 sq. ft. per effect.
- 1—4'x16" Hardinge Conical Ball Mill, iron-lined, with motor and ball charge.
- 2—SWEETLAND #12 FILTERS, 4" C. C. 36 iron leaves, late style, vertical fittings.
- 1—SPERRY 42"x42", CAST IRON FILTER PRESS, plate-frame. 55 chambers; 1—SHRIVER 36"x36", washing, 60 chambers; 20 others, 30"x30" to Laboratory sizes.
- 11—Heat Exchangers, Ahlberger; 50, 100, 300, 440, sq. ft. heating surface also smaller sizes with bronze heads and cast iron shells.
- 1—PROCTOR & SCHWARTZ, 9-Track Atmospheric Dryer, 40 trays per truck, 1962 sq. ft. tray surface.

- 4—ATMOSPHERIC DRUM DRYERS; 1—3'x9' Bronze double drum; 2—Anco 4'x9' single drum; 1—4'x9'.
- 8—ROTARY VACUUM DRYERS; 1—BUFFALO 5'x30"; 5—DEVINE 4'x25"; 1—DEVINE 4'x30"; 1—STRUTHERS WELLS 30"x12'.
- 1—10' dia. x 40" face REVOLVING DRYER.
- 2—ROTARY VACUUM DRUM DRYERS; 1—Buffalo 48'x40" Single Bronze Drum; 1—Devine 3'x9' Double Bronze Drum.
- 1—20 gal. MONEL KETTLE, electrically heated.
- 1—50 gal. STAINLESS STEEL LINED jacketed.
- 3—Rotary Kilns: 6' x 60', 8' x 80', 8' x 100'.
- 8—ROTARY DRYERS; 3'x20', 4'x30', 5'x30', 6'x40'.

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- 10—Steel Tanks: 4—5000 gal. vert. closed; 1—5000 gal. open, agitated; 4—1000 gal. vertical.
- 1—Sharpies centrifuge with monel bowl.
- 1—54" dia. Copper Jacketed Vacuum Pan.
- 1—250 gal. Copper Jacketed Kettle.
- 1—30" Centrifugal Extractor.
- 2—Portable Bag Pliers, m.d.
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|-------------|--------|------|------|----------|-------|-------|------|------|----------|
| Quan. | HP | Make | Type | Speed | Quan. | HP | Make | Type | Speed |
| 5 | 1 1/2 | West | SK | 1750 | 5 | 3 | Roth | | 500/1000 |
| 12 | 1 | West | SK | 1150 | 1 | 3 | West | SK | 1750 |
| 1 | 1 1/2 | Rel. | T | 500/1000 | 2 | 5 | GE | RC | 1150 |
| 1 | 12 | West | SK | 1150 | 1 | 5 | West | SK | 400/1600 |
| 12 | 12 | GE | RC | 1750 | 10 | 5 | West | SK | 850 |
| 12 | 12 | GE | BD | 1750 | 12 | 7 1/2 | C.W. | CCM | 850 |
| 3 | 12 | West | SK | 850 | 3 | 7 1/2 | West | SK | 850 |
| 8 | 12 | C.W. | CCM | 1150 | 3 | 7 1/2 | West | SK | 1750 |
| 10 | 12 1/2 | GE | RLC | 500/1000 | 1 | 7 1/2 | GE | CD | 1750 |
| 1 | 3 | Star | | 1750 | 2 | 7 1/2 | GE | RC | 1150 |
| 1 | 3 | GE | RC | 1750 | 4 | 7 1/2 | GE | RC | 850 |
| 12 | 3 | West | SK | 1150 | 1 | 10 | GE | RC | 1800 |
| 5 | 3 | West | SK | 850 | 1 | 10 | West | SK | 1325 |

| Quan. | HP | Make | Speed |
|-------|-------|-------|-------|
| 13 | 1 | Wag. | 1200 |
| 1 | 1 1/2 | Cent. | 900 |
| 5 | 3 | Imp. | 3600 |
| 1 | 3 | Rel | 1200 |
| 1 | 3 | C.W. | 1200 |
| 2 | 5 | GE | 1200 |

| 220/440 VOLT—SLIP RING | | | |
|------------------------|----|------|-------|
| Quan. | HP | Make | Speed |
| 1 | 30 | GE | 900 |

| Quan. | HP | Make | Speed |
|-------|-----|------|-------|
| 3 | 100 | GE | 720 |
| 3 | 75 | GE | 900 |

BOILERS

3—316 HP Heine W.T. 180 lb. ASME
2—500 HP Heine W.T. 200 lb. complete with stokers etc.

220/440 VOLT AC—SQUIRREL CAGE

| Quan. | HP | Make | Speed |
|-------|----|------|-------|
| 1 | 5 | West | 1800 |
| 3 | 5 | GE | 3600 |
| 2 | 15 | Cent | 1200 |
| 1 | 15 | Wag | 900 |
| 5 | 15 | Rel | 900 |
| 1 | 20 | U.S. | 720 |
| 1 | 20 | West | 1200 |

550 VOLT—SLIP RING

| Quan. | HP | Make | Speed |
|-------|----|------|-------|
| 2 | 15 | GE | 900 |
| 1 | 25 | GE | 900 |

2300 VOLT—SQUIRREL CAGE

| Quan. | HP | Make | Speed |
|-------|----|------|-------|
| 4 | 75 | GE | 720 |
| 2 | 60 | GE | 900 |

| Quan. | HP | Make | Speed |
|-------|-----|------|----------|
| 6 | 15 | Rel | 850 |
| 1 | 15 | West | SK 1150 |
| 2 | 15 | West | SK 850 |
| 7 | 15 | GE | RC 850 |
| 1 | 20 | Rel | T 825 |
| 1 | 20 | West | SK 850 |
| 1 | 25 | West | S 650 |
| 1 | 30 | AC | 575 |
| 1 | 35 | GE | LC 650 |
| 1 | 40 | AC | 950/1150 |
| 3 | 50 | West | SK 565 |
| 1 | 100 | Rel | T 500 |

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- SHRIVER** 12" All Lead Filter Press, closed delivery 18 chamber.
- SHRIVER** 7" cast iron closed delivery, Filter Press, with hand pump.
- SHRIVER** Type 8" cast iron, closed delivery, nickel plated Filter Press.
- 4—DEVINE 200 gal. agitated closed, cast iron kettles.
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- 1—Stainless Steel Water Jacketed Tank, 500 gal., open top.
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- 2—Buffalo, Devine Vacuum Drum Dryers, 24" x 20", 3' x 9'
- 3—Atmospheric Double Drum Dryers, 4' x 9', 3' x 8', 28" x 60"
- 2—Atmospheric Single Drum Dryers, 4' x 8'
- 1—Rotary Dryer, 3' x 25', with stainless steel shell
- 7—Rotary Dryers, 3' x 18', 3' x 30', 4' x 30', 5' x 28', 5' x 35', 5½' x 51', 6' x 65'
- 1—Indirect Rotary Dryer, 6' x 39', stainless steel
- 2—Hersey Hot Air Dryers, 5' x 25', 6' x 25'
- 1—P. & S. Atmospheric Tray Dryer
- 1—Stokes Laboratory Vacuum Oven
- 1—Freas Electric Oven, 18" x 18" x 18"
- 3—Herreshoff & Wedge Roasting Furnaces
- 1—U. S. No. 4B Furnaces

KETTLES—PANS—CRYSTALLIZERS

- 2—Devine Type 7' dia. Crystallizers, with condensers
- 2—Dillon 6' x 8' Jacketed, Agitated Pressure Kettles
- 2—Devine Kettles, jacketed, agitated, 750 gal.
- 1—Bullovak Impregnating Kettle, 42" x 60", jacketed, closed, hinged cover
- 5—Copper Vacuum Pans, 2', 2' 6", 6' and 7' dias.
- 1—Closed Steel Still, 5' 6" dia. x 8' 9", jacketed
- 25—Copper Steam Jacketed Kettles, 10 to 500 gals.
- 5—Steel Jcktd. Kettles, agitated, 50 to 1000 gal.
- 5—Steel Closed Jacketed Kettles, 7' x 4', 9' x 5', 5½' x 6', 1000 to 1500 gals.
- 5—Autoclaves, 1, 5, 25, 80 gals.

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- 1—Weston 40" Suspended Type Centrifugal, steel basket, bottom discharge, with 40 HP 3/60/220 volt motor
- 3—Centrifugals, 20" to 30", under-driven
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- 4—De Laval Centrifuges, Nos. 200, 300, 600, 700

SPECIALS!

- 1—Struthers Wells Single Effect Vertical Evaporator, 11' 6" dia., having 1560—4" x 4' steel tubes
- 1—Hamilton 22" x 30" Corliss Engine connected to 360 KW G.E. Generator, 3/60/480 volt
- 2—20' x 20' Open Top Steel Tanks
- 2—Glens Falls Sulphur Burners, 20" x 8'
- 3—Steel, Lead Lined Absorber Tanks, 6' 6" x 7'
- 1—Lead Lined Mixing Tank, 6' 9" x 6' 4" deep, with agitator and 5 HP motor
- 2—Nash No. 4 Vacuum Pumps, with 30 and 40 HP 3/60/440 volt motors
- 2—S. & K. 2", 3" Lead Centrifugal Pumps, motor driven
- 1—Allis Chalmers 2½" Bronze Centrifugal Pump, with 3 HP motor
- 4—Allis Chalmers 2" Centrifugal Pumps
- 3—Copper Storage Tanks, 2000 and 2500 gals.
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- 1—Fairbanks Morse Rotary Pump, 2½", with 5 HP geared motor
- 1—Shepard one ton Electric Hoist
- 6—Copper Vacuum Pans, 24", 30", 32", 6' and 7' dias.
- 1—42" dia. Copper Rectifying Column
- 1—Devine Type 3' x 9' Single Vacuum Drum Dryer
- 2—Rubber Lined Tanks, 350 gal.
- 1—Devine Double Door Vacuum Shelf Dryer, with 13-59" x 78" shelves
- 2—Devine 750 gal. Jacketed, Agitated Kettles
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- 1—Badger 1000 gal. Copper Still, with tubular condenser.

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- 2—Day No. 30 Imperial Mixers, steam jacketed, 75 gal. working capacity
- 2—Day Hercules Mixers, motor driven, 5 bbl.
- 1—Ross 150 gal. working capacity, heavy duty, double arm, Jacketed Mixer
- 2—W. & P. Mixers, 4½ and 9 gals.
- 1—W. & P. 50 gal. Vacuum Mixer
- 5—Day Change Can Mixers, 8 to 40 gals.
- 1—Day Universal Mixer, jacketed, 265 gal.
- 20—Day, Robinson Dry Powder Mixers, 25 to 2000 lbs.

FILTER PRESSES—FILTERS

- 1—Shriver 24" x 24" Steam Jacketed Cast Iron Filter Press, 30 chambers
- 1—Sperry 32" x 32" Cast Iron Press, closed delivery, 26 chambers
- 1—Sperry 36" x 36" Cast Iron Filter Press, 48 chambers, 1" cake
- 2—Oliver United 36" x 36" Cast Iron Filter Presses, 41 chambers, 1½" cake
- 10—Shriver, Sperry Filter Press Skeletons, 12" to 36" sq.
- 10—Kilby 30" x 30" Cast Iron Recessed Filter Presses, each having 38 plates
- 1—Oliver 3' x 2' Cast Iron Filter
- 1—Oliver 6' x 4' Wood Stave Filter, bronze valve and piping
- 3—Oliver 11' 6" dia. x 8' face Filters, steel troughs, wood stave
- 3—Nos. 5, 7, 10 Sweetland Filters

PULVERIZERS—GRINDERS

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- 8—Rubber Lined Pebble Mills, 24" x 36", 36" x 36"
- 1—Allis Chalmers 3' x 5' Rubber Lined Ball Mill
- 15—Abbe & Patterson Pebble & Ball Mills, 25 to 200 gal.
- 6—Day, Ross Roller Mills, 5" x 12", 9" x 24", 12" x 32", 16" x 40"
- 1—Raymond 4 Roll High Side Roller Mill
- 3—Raymond Pulverizers, Nos. 0000, 00, 3
- 2—Mikro Pulverizers, 12", 24"
- 5—Jeffrey Hammer Mills, 24" x 36", 18" x 24", 8" x 15", 36" x 18"
- 15—Williams, JayBee Hammer Mills, 5 to 100 HP
- 10—Sturtevant Jaw Crushers, 2" x 6" to 24" x 36"
- 5—Hardinge Ball Mills, 3' x 8' dia.
- 1—Ball and Jewell Rotary Cutter, No. 2
- 1—Robinson 26" Attrition Mill, with 2—20 HP AC motors
- 6—U. S., Premier Colloid Mills, ½ to 50 HP

MISCELLANEOUS

- 3—Tyler Hammer Screens, single, double, triple deck, 4' x 5'
- 1—Robinson Gyro-Sifter, 32" x 90"
- 5—Rotex Sifters, 40" x 56", 40" x 84"
- 6—Vertical Juice Heaters, 500 Sq. ft.
- 12—Glass Lined Storage Tanks 50 to 1000 gal.
- 19—Steel Storage Tanks, from 3500 to 46,000 gal.

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Copper Steam Jacketed Kettles 10-150 gal. capacity with and without agitators.

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- 15-Pony Mixers, 8, 15 and 40 gal.
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- NEW PORTABLE MIXERS, std. and ex. proof 1/4 to 10 HP
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- 1-Rotary Dryers, 4'x30'.
- 1-Black & Clawson Two-Drum Dryer, 28"x60'.
- 4-Werner & Pfleiderer Mixers, 2000-gals.
- 3-Werner & Pfleiderer Mixers, 100-gals.
- 2-Werner & Pfleiderer Mixers, 20-gals; 50-gals.
- 1-Werner & Pfleiderer Lab. Jacketed Mixer, 2-qts.
- 13-Sharples Super Pressure Centrifuges, 3 H.P. Motors.
- 1-American Humatic Suspended Extractor, 48" copper basket.
- 25-Extractors, all makes, 7" to 60", copper, steel, and rubber baskets.
- 1-Stokes Evaporator, 52"x9", pump & condenser.
- 1-Copper Jacketed Still, 50-gals., column & condenser.
- 2-Kilby double-effect Evaporators, 3" brass tubes.
- 3-Single-effect Evaporators, 2" copper tubes.
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- 12-Filter Presses, all makes, 12"x12" to 24"x24".
- 2-Rod Mills, 5'x7'; 3'x6'.
- 1-Hendy Continuous Ball Mill, 3'x12', 75 H.P. Motor.
- 2-Abbe Rotary Cutters, #1 1/4; #2.
- 19-Patterson, Abbe, West Pulverizing Ball Mills, lab. to 1000-gals., lined & unlined.
- 17-Ross, Kent, Day 3-roll Mills, lab. to 16"x40".
- 5-Raymond Mills, #0000; #1.
- 6-Watson Mills, unlined, 2000#; 4000# 6000#.
- 1-Stearns Magnetic Separator, #2.
- 500-Steel Tanks, 250-gals. to 60,000-gals.

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One Buffalo 75 Gal. Jacketed Cast Steel Autoclave
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1-6 x 15' Allis Chalmers Tube Mill
1-26 x 24" 2-roll Link Belt Crusher
Dragline, Hammer Mills, Conveyors, Tanks, Elevators, Air Separators, Dust Collectors, Engines, Boilers, Pit Cars, Locomotive, Pulleys, Hangers, Revolving Screen, Revolving Drum.

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